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SALIVARY SECRETION AND THE INTAKE OF FLUID*

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It is well known that the various processes in the body may be influenced by changes in its metabolism. In regard to the salivary glands, Savitch in Pavlov's laboratory, working with dogs, and Krasnogorsky, working with children, have proved that overfeeding causes inhibition of the conditioned reflexes to the substances that are fed in abnormal amount and augmentation of the conditioned reflexes to other foods.

The object of these experiments was to determine whether thirst bears any relation to the secretion of saliva. It has already been shown in the laboratory of Pavlov that the gastric secretion in dogs may be greatly diminished when the intake of fluids is insufficient. The salivary and gastric secretions, however, are not always parallel.

I used two children in these researches, one for the investigation of the parotid and the other for the investigation of the submaxillary secretion. Krasnogorsky discovered that there are some differences between the functions of these two glands: the parotid gives a larger unconditioned reflex, and the submaxillary a larger conditioned reflex, as might be expected from their anatomic position; for it is the submaxillary gland that first encounters substances introduced into the mouth.

METHOD

The experiments were done under three sets of conditions: (*a*) with normal intake of fluids, (*b*) with forced intake of fluids and (*c*) with the production of thirst by a withholding of all fluids for twelve hours. In each case, the child was given an ordinary breakfast at 9 a. m., and experimentation was begun three hours later. With breakfast, the child received about 1,000 cc. of liquid, and when the intake of fluid was forced the child drank as much as from 2,000 to 3,000 cc. When fluid was withheld and thirst became great, it was difficult to get one of the children to accept salt herring, though she ate lemon with avidity.

A suction cup was applied over the opening of the parotid gland or of the submaxillary glands, respectively, and the saliva was collected in a graduate.[1]

* Submitted for publication, Dec. 22, 1928.

* From the laboratory of Prof. N. I. Krasnogorsky for Conditioned Reflexes in Children at the Filatov Hospital.

1. Krasnogorsky, N. I.: Die weitere Fortschritte in der Metodik der Erforschung der unbedingte und bedingte Reflexe bei Kindern, Jahrb. f. Kinderh. **114**: 255, 1926; 1928, vol. 120.

The conditioned reflex was measured after showing the food to the child for thirty seconds, and again after one minute, and then the food was immediately given to her to eat. She was directed to chew on the side of the mouth from which the saliva was being collected, as it has been noted in this laboratory that the secretion is greater on that side.[2] The collection was made from the submaxillary glands on both sides, as their openings are close together. Twenty grams of each of various foods were given to the child to eat and so timed that it was well chewed and swallowed during the course of three minutes, and the saliva was measured for each minute. The foods employed were: dry bread crumbs, ham, salt herring and lemon cut in slices; these were administered at intervals of ten minutes.

PAROTID SECRETION

"Lydotchka," in whom we tested parotid secretion, was an epileptic idiot, aged 11, who was having one or more violent convulsions daily. The results set forth in table 1 were typical.

TABLE 1.—*Effect of Forced Intake of Fluids on the Salivary Secretion of the Parotid Gland*

Time	Stimulus	Amount of Parotid Secretion per Minute
9 a.m.	2,900 cc. fluid given	
11:21 to 11:23 a.m.	20 Gm. dry bread crumbs	2.2, 2.4, 2.3 = 6.9 cc.
11:36 to 11:39 a.m.	20 Gm. ham	2.9, 2.0, 1.7 = 6.6 cc.
11:49 to 11:52 a.m.	20 Gm. salt herring	3.4, 2.6, 1.5 = 7.5 cc.
12:04 p.m.	Sight of lemon	11 drops in 30 seconds as conditioned reflex
12:05 to 12:08 p.m.	20 Gm. lemon	4.3, 2.8, 2.3 = 9.4 cc.

TABLE 2.—*Comparison of Amounts of Parotid Secretion Following on Different Degrees of Intake of Fluids*

	Amount of Parotid Secretion											
	Forced Intake of Fluids (Average of Five Experiments)				Normal Intake of Fluids (One Experiment)				Thirst (Average of Two Experiments)			
Stimulus	1st Min.	2d Min.	3d Min.	Total	1st Min.	2d Min.	3d Min.	Total	1st Min.	2d Min.	3d Min.	Total
Dry bread	1.95	2.0	1.95	5.8	1.3	1.3	2.0	4.6	1.5	0.7	0.5	2.8
Ham	2.7	1.9	1.5	6.1	3.4	2.6	1.7	2.7	1.3	0.6	0.4	2.4
Salt herring	2.7	2.0	2.0	6.7	2.4	2.0	1.6	6.0	1.4	1.0	0.7	3.1
Lemon	3.6	2.8	2.4	8.8	2.6	2.4	3.0	8.0	1.9	2.1	2.0	6.0

Table 2 shows the three minute salivary secretion on a normal intake of fluids, on a diminished intake and on an increased intake. With each food there was a marked diminution of secretion in the case of thirst. The secretion on a forced intake fluid was only slightly more than on a normal intake.

2. Krasnogorsky, N. I.: Ueber die Wirkung mechanischer und chemischer Reizungen verschiedene Teile der Mundhöhle auf die Tätigkeit der Speicheldrüsen bei Kindern, Jahrb. f. Kinderh. **114**:268, 1926.

We found that the epileptic fit tended to decrease markedly the unconditioned salivary secretion. The results recorded in table 3 show that the flow of saliva was much less when the experiment was done immediately after the child recovered consciousnes from the convulsion, whether fluid had been forced or withheld.

TABLE 3.—*Effect of Epileptic Convulsion on Salivary Secretion (Parotid)*

	With Forced Intake of Fluids		With Thirst	
Stimulus	(Average of Four Experiments) Amount of Secretion Before Convulsion, Cc.	(One Experiment) Amount of Secretion Soon After Convulsion, Cc.	Amount of Secretion Before Convulsion, Cc.	Amount of Secretion Soon After Convulsion, Cc.
Dry bread	6.3	4.5	3.9	1.8
Ham	6.3	4.6	3.8	0.9
Salt herring	7.4	5.7	3.1	Refused; defensive reaction
Lemon	8.5	9.2	6.6	5.4

SUBMAXILLARY SECRETION

My experiments with the submaxillary gland, which were made in a hysterical girl of 11, also show that the secretion is much lessened during a deficient intake of water. In table 4, it is shown that not only the unconditioned reflex but the conditioned reflex was decreased in the state of thirst.

TABLE 4.—*Effect of Different Degrees of Intake of Fluids on Submaxillary Secretion*

	Normal Intake			Thirst			Forced Intake		
Stimulus	Conditioned Reflex, Drops	Viscosity, Sec.	Unconditioned Reflex, Cc. (3 Min.)	Conditioned Reflex, Drops	Viscosity, Sec.	Unconditioned Reflex, Cc. (3 Min.)	Conditioned Reflex, Drops	Viscosity, Sec.	Unconditioned Reflex, Cc. (3 Min.)
Ham	6	12	9.3	10	..	3.9	22	19	9.8
				3	12	3.4			
Herring	30	20	10.8	16	..	3.4	..	20	10.1
				1	20	4.7			
Lemon	66	17	11.4	60	..	9.3			
				7	27	7.6	..	49	11.9
Bread	34 (dry bread)	20	7.5 (ordinary bread)	22	..	...			
				0	..	...	..	22	7.1

These experiments, conducted with four different foods and with both the parotid and the submaxillary glands, prove that the intake of fluids bears a definite relation to the quantity of saliva secreted. This fact is in agreement with that previously shown for the glands of the stomach, and may probably hold for all the glands of external secretion. It is therefore of prime importance for digestion that the fluid intake be sufficient. Furthermore, in work with conditioned reflexes, a state of thirst should not be present.

GROWTH IN INFANTS FROM THE STANDPOINT OF PHYSICAL MEASUREMENTS AND NITROGEN METABOLISM

I. CREATININE *

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Since the early methods for the determination of creatinine have been replaced by the more accurate quantitative methods of Folin, studies of the excretion of creatinine by infants and young children have become more significant. In contradiction to the previous investigations, which suggested that creatinine is present in the urine of infants only in febrile cases or when meat extract is added to their diet, Funaro,[1] by means of these more recent technics, has shown that creatinine is present always in the urine of infants, and that the amount under normal and pathologic conditions does not vary greatly. Further evidence of the excretion of creatinine by infants was presented by Amberg and Rowntree,[2] Sedgwick,[3] Rose[4] and others. The amount of creatinine nitrogen, according to Steudel,[5] is approximately 3.25 mg. per kilogram of body weight, whether the feeding consists of human or of cow's milk. The excretion day and night appears to be fairly constant, owing, Rougichitch[6] believed, to the uniformity of the muscle tonus and the anabolic processes of the infant during the day and night.

It is generally conceded that the output of creatinine is a measure of the active protoplasmic tissue, and according to most investigators,

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* The data of this report are taken from the thesis submitted by Miss Hejinian in partial fulfilment of the requirements for the degree of doctor of philosophy, Child Welfare Research Station, State University of Iowa, 1927.

1. Funaro, R.: Biochem. Ztschr. **10**:467, 1908.
2. Amberg, S., and Rowntree, L. G.: Bull. Johns Hopkins Hosp. **21**:40, 1910.
3. Sedgwick, J. P.: Creatinin and Creatin Metabolism in Children, J. A. M. A. **55**:1178 (Oct. 1) 1910.
4. Rose, W. C.: J. Biol. Chem. **10**:265, 1911.
5. Steudel, N.: Klin. Wchnschr. **5**:1908, 1926.
6. Rougichitch, O. S.: Arch. Dis. Childhood **1**:289, 1926.

there is a direct relationship between the output of creatinine and body weight. The term "creatinine coefficient" [7] (milligrams of creatinine per kilogram of body weight) has been coined to express this relationship. Benedict and Myers,[8] however, postulated that length rather than weight may be more nearly an index of muscle tissue. In the investigation herein reported, an attempt has been made to determine whether in infants the output of creatinine runs more nearly parallel with body weight than with length or vice versa.

Consecutive metabolic studies have been made of each of nine male infants ranging in age from approximately 2 to 8 months. These received, from the time that they were 18 days of age, feedings of modified cow's milk. Orange juice and cod liver oil were given daily. Each metabolic study extended over three days with at least seven days intervening between the various periods. During this three day period, quantitative collections of urine were made. The daily determinations of the creatinine gave assurance of the completeness of the collections. The average of the three days' determinations is reported. The infants were weighed at the same hour each day, with the exception of the days when they were on the metabolism frame. Then they were weighed at the beginning and at the end of the period. Anthropometric measurements were taken each month. Folin's [9] microcolorimetric methods were used for the determinations of creatinine, which were made in duplicate in all cases. Determinations of creatine and uric acid also were made, as well as of the total nitrogen of the urine and stools. These results will be reported in subsequent papers.

The results of the investigation of excretion of creatinine are given in the accompanying table and chart.

It will be observed that the amount of creatinine excreted by a given infant increases with the age of the infant. The youngest infant, however, may not excrete the smallest amount of creatinine. Baby J. M., the youngest infant in the group, excreted somewhat more creatinine (62.5 mg.) than baby R. C. (57.3 mg.) who was slightly older. Baby E. M., on the other hand, who was of the same age as baby R. C., excreted considerably more (65.6 mg.). Between two infants of the same age there was a difference of 8.36 mg. in the amount of creatinine excreted; and a difference of eighteen days in age between two infants (baby E. M. and baby M. E.) who excreted the same amount of creatinine. As the infants grew older, they showed an even greater variation in excretion of creatinine at the same age level. At 6 months and 29 days, baby R. C. excreted 79.7 mg., while baby P. H. at approxi-

7. Shaffer, P. A.: Am. J. Physiol. **23**:1, 1908.

8. Benedict, F. G., and Myers, V. C.: Am. J. Physiol. **18**:377 and 397, 1907.

9. Folin, O.: J. Biol. Chem. **17**:469, 1914.

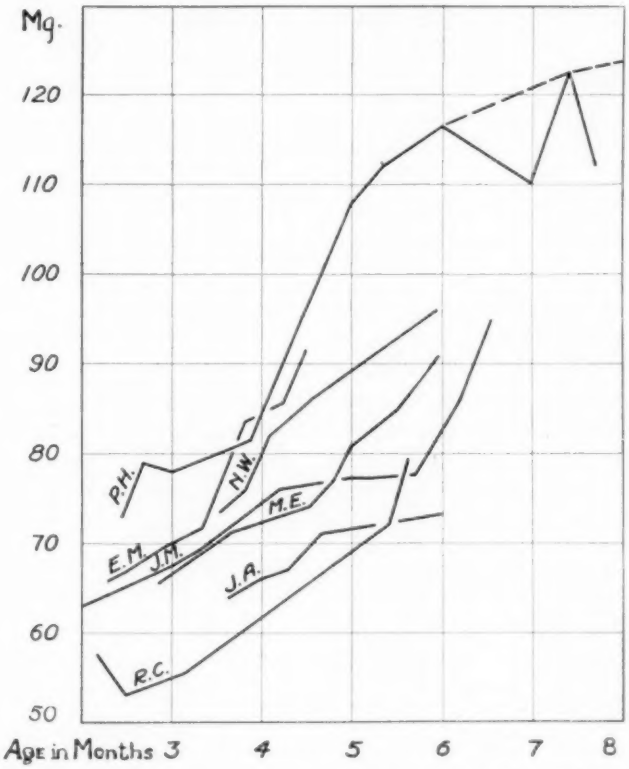
TABLE 1.—*The Relation of Excretion of Creatinine to Weight and Length*

Infant	Age		Creatinine, Mg.	Weight, Gm.	Length, Cm.	Creatinine per Kg., Mg.	Creatinine per Cm., Mg.
	Mo.	Days					
J. A.	3	20	63.12	5,676	....	11.12	....
	4	0	66.05	5,980	....	11.04	....
	4	8	66.99	6,330	....	10.58	....
	4	21	71.41	6,750	....	10.72	....
	6	0	73.30	7,285	....	10.06	....
Average						10.70	
N. W.	3	15	73.40	6,760	....	10.85	....
	3	25	76.13	7,172	....	10.61	....
	4	3	82.08	7,605	....	10.79	....
	4	17	86.60	8,100	66.8	10.69	1.29
	5	29	90.26	9,290	70.2	10.36	1.37
Average						10.66	
A. R.	4	25	93.11	7,500	69.4	12.41	1.34
	5	11	97.50	7,750	69.8	12.58	1.39
Average						12.49	
B. C.	4	7	77.72	5,500	60.8	14.13	1.27
	4	14	76.94	5,660	61.2	13.59	1.25
	5	6	79.00*	6,360	62.8	12.42	1.26
	5	23	80.65	6,840	65.1	11.79	1.23
Average						12.98	
R. C.	2	6	57.26	4,840	58.6	11.83	0.97
	2	15	53.07	5,090	59.6	10.42	0.89
	3	4	55.46	5,550	61.7	9.99	0.89
	5	12	72.18	6,850	67.7	10.53	1.06
	5	19	79.22	6,965	68.1	11.37	1.16
	6	29	79.74	7,566	69.5	10.54	1.14
Average						10.78	
M. E.	2	26	65.15	5,580	58.5	11.68	1.11
	3	21	71.41	6,030	60.9	11.90	1.17
	4	16	74.38	6,500	62.8	11.44	1.18
	4	24	76.95	6,750	63.6	11.40	1.20
	5	0	80.98	6,830	64.2	11.85	1.26
	5	16	84.99	7,050	65.1	12.05	1.30
	5	29	90.93	7,030	65.9	12.93	1.37
Average						11.98	
J. M.	1	28	62.52	5,400	58.4	11.58	1.07
	3	1	67.58	6,000	61.4	11.26	1.10
	3	10	69.22	6,350	61.9	10.90	1.10
	4	7	76.38	7,000	64.6	10.91	1.18
	4	22	77.28	7,480	65.1	10.37	1.18
	5	6	77.26	7,600	65.8	10.16	1.17
	5	21	77.64	7,850	66.9	9.89	1.16
	6	2	85.87	8,150	67.2	10.53	1.27
	6	17	94.99	8,450	67.8	11.24	1.40
Average						10.76	
P. H.	2	13	73.02	6,086	63.4	12.00	1.15
	2	21	79.42	6,500	64.1	12.21	1.23
	3	0	78.75	6,800	65.5	11.57	1.20
	3	26	81.87	7,370	67.7	11.10	1.20
	5	0	108.01	8,500	71.2	12.70	1.51
	5	8	112.31	8,820	72.0	12.74	1.55
	6	0	116.64	9,300	73.5	12.54	1.58
	7	0	121.00†	9,600	75.2	12.60	1.60
	7	8	122.95	9,800	75.6	12.54	1.62
	7	21	124.00‡	9,950	76.3	12.46	1.63
Average						12.24	
E. M.	2	8	65.62	5,450	57.6	12.04	1.13
	2	14	66.51	5,650	58.0	11.77	1.14
	2	25	69.77	6,050	59.8	11.53	1.16
	3	10	71.92	6,500	60.9	11.05	1.17
	3	25	83.61	7,000	62.5	11.94	1.33
	4	7	85.65	7,150	63.9	11.98	1.34
	4	14	91.41	7,450	64.5	12.28	1.41
Average						11.8	

* Estimated. Found = 83.43.
† Estimated. Found = 110.56.
‡ Estimated. Found = 112.82.

mately the same age (7 months) excreted 121.8 mg., a difference of 42 mg. in the output of creatinine of these two infants at the same age level.

Further consideration of the relationship between excretion of creatinine and increasing age indicates that there may not be in all cases a regular increase in the amount excreted as the individual infant grows older. A number of the infants studied showed a rather sudden increase in the daily excretion at some time between the ages



These graphs illustrate the increase in the excretion of creatinine of seven infants from 2 to 7 months of age. The broken line (*P.H.*) represents the estimated excretion; the solid line the actual excretion.

of 3 and 6 months. Baby E. M. showed the increase at about 3 months, while baby J. M. showed a slight but gradual increase until he reached the age of about 5 months, 21 days, when there was a distinct increase in the excretion.

This sudden increase in the excretion of creatinine appears to be related to an increase in muscular activity, which in the very young infant is negligible. At about 4 months of age, baby P. H. began to take a more active interest in life, as demonstrated by more frequent

movements of both arms and legs. This seemed to be coexistent with the increase in the excretion of creatinine. In contrast with baby P. H. was baby J. A., who was characterized as a lazy baby, for he seemed to take little active interest in his surroundings, lying quietly in his crib. His rate of excretion of creatinine increased gradually throughout the period of study (six months). The theory that the creatinine of the urine is directly related to muscle metabolism offers an explanation for these seemingly sudden increases.

The creatinine coefficients of the infants in this study varied slightly with different infants. The lowest average for a given infant was 10.66 and the highest 12.98. The smallest amounts of creatinine excreted per kilogram of body weight were 9.89 mg. by baby J.M. at 5 months, 21 days, and 9.99 mg. by baby R. C. at 3 months, 4 days. Baby J. M. weighed 7.85 Kg., while baby R. C. weighed only 5.55 Kg. The largest amount of creatinine excreted per kilogram of body weight was 14.13 mg. by baby B. C. at 4 months, 7 days, when he weighed 5.5 Kg. Baby M. E., on the other hand, maintained a stationary weight between the ages of 5 months and 16 days and 5 months and 29 days. During this period his elimination of creatinine increased from 85 to 91 mg. while his creatinine coefficients in these two successive periods were 12.02 and 12.93, respectively. These data seem to give little evidence of a significant relationship between weight and the excretion of creatinine.

Reports by other workers corroborate these observations. In 1908, van Hoogenhuyse and Verploegh [10] noted that considerably less creatinine was excreted by a weak child, 2 months of age, who was fed cow's milk than by the other infants, who were breast fed. Amberg and Morrill [11] showed that the lowest amount of creatinine per kilogram of body weight was excreted by an infant who was fat, while the highest amount per kilogram was excreted by an infant who was not well nourished. Wang, Frank, Kern and Hays [12] studying the metabolism of undernourished children, observed that there was a tendency for the values of the creatinine to rise until the group that was 10 per cent underweight was passed, and then there was a slight drop. In children who were 15 per cent or more below the average in weight there appeared to be a loss of active protoplasmic tissue, indicated by a lowered basal metabolism and a lowered creatinine coefficient. Wang believed that the child not more than 15 per cent underweight is simply deficient in the store of body fat. He has as much active protoplasmic tissue as the normal child of his height and would-be weight, and is excreting the

10. Van Hoogenhuyse, C. J. C., and Verploegh, H.: Ztschr. f. Physiol. Chem. **57**:161, 1908.

11. Amberg, S., and Morrill, W. P.: J. Biol. Chem. **3**:311, 1907.

12. Wang, C. C.; Frank, M.; Kern, R., and Hays, B.: Metabolism of Undernourished Children: II. Basal Metabolism, Am. J. Dis. Child. **32**:350 (Sept.) 1926.

same amount of creatinine. His creatinine coefficient, therefore, would be higher. Since body weight is, in part, a measure of inert adipose tissue and bone, as well as muscle mass, a direct relationship of increasing weight to excretion of creatinine in infants would not be in accord with our present conception of the source of the urinary creatinine.

That there may be a closer correlation between length of body and elimination of creatinine than between weight and excretion of creatinine is shown by a number of the infants studied. During a two week's period of stationary weight the excretion of creatinine of baby M. E. increased from 85 to 91 mg., and at the same time he increased in length from 65.1 to 65.9 cm. Baby N. W. and baby A. R. were nearly the same length (70.2 cm. and 69.8 cm.) and their excretions of creatinine also were similar, 96 and 97 mg., respectively. Baby N. W. weighed considerably more than baby A. R. and therefore had a lower creatinine-weight coefficient. Both infants had, however, practically the same creatinine-length coefficients. These observations are in accord with the theory of Benedict and Myers,[8] and suggest that the milligrams of creatinine excreted per centimeter of length may be a more accurate measure of the muscular development of the infant than the creatinine-weight coefficient.

The milligrams of creatinine excreted per centimeter of length in the group of infants studied ranged from 0.89 to 1.62. With two infants, baby M. E. and baby E. M., there was a regular and uniform increase in the amount of creatinine excreted per centimeter of length. With other infants, also, there was a regular increase which was consistent, although somewhat less uniform. A comparison of the various infants of a given length indicates that their excretions of creatinine, and therefore their creatinine-length coefficients are fairly comparable. For example, babies M. E., J. M. and E. M. excreted between 90 and 94 mg. of creatinine. In length, they measured between 64 and 68 cm. Their creatinine-length coefficients were between 1.37 and 1.41. The creatinine-length coefficients of baby R. C., on the other hand, were lower than those of any of the other infants studied. At 6 months, 29 days, he was 69.5 cm. long and excreted only 79.74 mg. of creatinine $\left(\frac{\text{creatinine}}{\text{length}} = 1.14\right)$, whereas baby A. R. at 5 months, 11 days measured 69.8 cm. and excreted 97.5 mg. of creatinine $\left(\frac{\text{creatinine}}{\text{length}} = 1.3\right)$. Other things being equal, it would seem that the infant who has the higher muscular development for his length, indicated by a high creatinine-length coefficient, is the more nearly physically fit. Comparing these two infants with height and weight norms [13] for young infants shows that baby R. C. was 1.4 pounds (0.7 Kg.) underweight, while baby A. R. was nearly 2 pounds (0.9 Kg.) underweight. Baby A. R., however, had

13. Norms of Height and Weight for Preschool Children, Iowa Child Welfare Research Station and Federal Children's Bureau.

an average creatinine weight coefficient indicating a normal amount of body fat for his muscular development; while baby R. C. had a low creatinine-weight coefficient, suggesting that he was too well padded for his muscular development. In contrast with baby A. R. was baby N. W., with a low creatinine-weight coefficient and approximately the same creatinine-length coefficient. According to the accepted norms for infants of this age, baby N. W. was 2 pounds (0.9 Kg.) overweight. Baby B. C., with a high creatinine-weight coefficient, and a high creatinine-length coefficient, conformed to the norms for his age and weight, but was shorter than the average infant of his age. Baby E. M., who was 1 pound (0.5 Kg.) overweight, seemed to be well developed. He had a high calcium and phosphorus retention ratio,[14] normal calcification of bone, as was indicated by roentgenograms taken each month, an average creatinine-weight coefficient and a high creatinine-length coefficient. Baby M. E. was slightly less well developed.

These observations lead one to conclude, tentatively, that the relationship of excretion of creatinine to length (the creatinine-length coefficient) gives a more nearly accurate measure of a child's physical development than is shown either by his creatinine-weight coefficient or his height-weight relationship. Many more data are needed in order to test this hypothesis, and to determine the norms of children of different ages. It is believed, however, that if such norms can be established, one will be in a position to judge better the physical development of children. This may lead to a more rational method of evaluating and treating the so-called undernourished child.

SUMMARY

In consecutive metabolic studies of nine infants between 2 and 8 months of age, the elimination of creatinine has been considered in relation to (1) age, (2) weight and (3) length.

It was found that the output of creatinine increased as the infants grew older. In some cases, this was gradual; in others, there was a sudden increase between the third and sixth month of age. This appeared to be coexistent with the greater muscular activity of the infant.

The creatinine-weight coefficients of all the infants studied were fairly comparable and were consistent for a given infant.

The creatinine-length coefficients increased with increasing age. Infants of the same length, in general, had the same creatinine-length coefficients irrespective of age or weight. It is suggested that the relation of creatinine to length may give a more nearly accurate measure of a child's physical development than is shown by his creatinine-weight coefficient, or his height-weight relationship.

14. Daniels, A. L., and Hutton, Mary K.: Proc. Soc. Exper. Biol. & Med. **25**:794, 1928.

ENURESIS IN CHILDREN

OBSERVATIONS ON CAUSATION AND TREATMENT *

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Thirty of a total of ninety children, residents in the Norwegian Lutheran Home for Children, were studied. Fifteen of these were enuretic, and fifteen served as a control group. All of the children in the home about whom there were complaints of bed wetting were included, with the exception of two, aged 3 years. Nine boys and six girls comprised each group. They ranged in age from 5 to 14 years. The objectives of this study were: (1) to determine and evaluate causative factors of enuresis in each individual case, if possible; (2) to determine significant differences, if any, between the enuretic group and a nonenuretic group of children from the same home and (3) to determine the response of the enuretic children to a group method of treatment.

INCIDENCE OF ENURESIS

Of the fifteen enuretic children included in our study, eight were known to have had the condition before admission to the home; two became enuretic after admission, according to the statements of their parents, and in five the time of the onset could not be definitely determined. "Familial" enuresis was common among this group. The fifteen enuretic children represented ten separate families. In no instance was there an only child. In seven of the ten families, more than one child was, or had been, enuretic. In two of these same seven families, parents or near relatives had been enuretic. In only three families, then, did the enuretic child of our group represent the only known cases of enuresis.

COMPARATIVE CASE STUDIES OF FIFTEEN ENURETIC AND FIFTEEN NONENURETIC CHILDREN

Social Data.—Institutional Home: The home is located in a suburb of Chicago. There is provision for ample playground. Boys and girls

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sleep in separate dormitories; only when crowded to capacity do two children sleep together. Each dormitory, containing from twelve to twenty beds, is supervised by an experienced matron.

Norwegian Lutheran sisters are in charge, and the home atmosphere is religious. The children assist with the general care of the home, being assigned specific duties.

They attend public school a mile distant. For the younger children, a kindergarten is maintained by the home. A free play period is usually allowed between 3 and 5:30 p. m.

Social Background: The families of both groups were studied through agency records, personal interview and the verbal reports of the staff of the home. The children are predominantly Norwegian, with some admixture of German and Swedish stock.

Nine families were represented by the enuretic children and twelve by the nonenuretic children. None of them were of a superior social or economic level. In twelve instances, one or both parents of the enuretic children were considered mentally unstable (representing eight families), while the parents of seven of the nonenuretic children (representing seven families) were similarly characterized. Such factors as psychopathy, alcoholism, sex promiscuity and economic irresponsibility are included under the term "unstable." The parents of two of the children in the enuretic group were reported to have been tested as mentally defective. Information was not generally available on this point.

TABLE 1.—*Comparison of Groups in School Work*

	Enuretic Group	Nonenuretic Group
Good	7	12
Fair	6	1
Poor	2	2

School Progress: The nonenuretic children were reported by the teachers as doing somewhat better work in school than the enuretic children.

Adjustment in the Institutional Home: The general adjustment of the child in the home was investigated. This adjustment was considered good when there was no apparent friction, and when there was normal behavior in relation to other children and to matrons. Some children were reported as doing well in relation with the matrons, but not with the other children, or this situation was reversed.

On the basis of these reports, no significant differences could be determined among the two groups. In nine of the enuretic children, there were other behavior complaints; there were specific complaints in nine instances among the children of the control group.

No especial relationships could be determined between the character of behavior complaints and the enuretic condition. Among the control group, seven children were characterized as defiant or as "domineering" toward other children. This behavior was complained of among only four of the enuretic group. Complaints of sex-play, masturbation, cruelty to other children or animals, destructiveness and thumb-sucking were confined to those in the enuretic group.

Physical Data.—General Physical Observations: Physical examination revealed minor differences between the children of the enuretic and nonenuretic groups. While the general physical condition of all of the children was fairly good, with exceptions as tabulated in table 4, the

TABLE 2.—*Adjustment in the Home of the Two Groups*

	Enuretic Group	Nonenuretic Group
Good	7	8
Fair	4	5
Poor	4	2

TABLE 3.—*Behavior Complaints*

	Nine Children in Enuretic Group	Nine Children in Nonenuretic Group
Stealing	2	1
Lying	1	1
Temper display	1	2
Slovenly and "lazy"	1	2
Defiant	2	4
Domineering toward other children	1	3
Masturbation	2	0
Sex-play	1	0
Cruel to animals	1	0
Bites other children	2	0
Thumb-sucking	1	0
Nail-biting	1	0
Stubborn	1	0
Unreliable	1	0
Destructive to clothing	1	0
Fighting	1	0

general nutritional state of the children in the nonenuretic group as noted on examination, and according to weight, was somewhat better than that of those in the enuretic group. Eight of the nonenuretic children were more than 10 per cent overweight; only two of the enuretic children were more than 10 per cent overweight. None of the enuretic children and one nonenuretic child were over 10 per cent underweight. The nonenuretic children averaged 7.9 per cent overweight, while the enuretic children averaged 1.1 per cent overweight.

Evidence of vasomotor disturbance was more frequently noted among the enuretic children, and adherent or tight prepuce was observed among five of the enuretic boys; these conditions were not encountered among the nonenuretic children. A greater number of physical defects were found among the enuretic children. It may be said that,

on the whole, the physical condition of the nonenuretic children was somewhat better than that of the children of the enuretic group. Except for the relative frequency of tight and adherent foreskin in the enuretic boys, a significant relationship between the specific character of physical defect and enuresis was not apparent among these children.

Cardiovascular Efficiency: A number of the children of both groups studied were subjected to a circulatory rating test.[1] In this test stability of blood pressure and of pulse, under standard conditions of exercise, were rated. Children with efficient cardiovascular systems showed

TABLE 4.—*Physical Data on Enuretic and Nonenuretic Children*

	Enuretic	Nonenuretic
General Physique		
Good	7	8
Fair	6	6
Poor	2	1
Type of Build		
Stocky	5	6
Slender	9	5
Medium	1	4
Overweight (10 per cent or more)	2	8
Underweight (10 per cent or more)	0	1
Carious teeth	1	7
Teeth irregularly aligned	2	0
Narrow palate	2	2
Vasomotor instability (skin changes)	4	1
Enlargement of the thyroid	1	4
Infected tonsils	4	2
Poor posture	6	7
Scoliosis	2	1
Atrophic testis	1	0
Sluggish pupils	1	0
Nasal infection	1	0
Nasal obstruction	1	0
Tight or adherent prepuce	5	0
Tuberculous joint	1	0
Enlarged cervical glands	3	0
Exophthalmos	1	0
Sluggish tendon reflexes	1	0
Undescended testis	1	0
Lordosis	1	0
Choreic symptoms		
Adiadokokinesis	1	0
Marked associated movements	1	0
Stigmas	3	0
Rachitic deformities	0	1
Kyphosis	0	1
Hypothyroid symptoms (skin, hair, etc.)	0	1
"Thymic type"	0	1

higher ratings. All children over 8 years of age were subjected to the test. Those younger than 8 years could not satisfactorily carry out the prescribed exercises. Trentzsch has adapted the test for children between ages of 10 and 15 years. The ratings obtained are shown in table 5.

With one enuretic boy (R. O., aged 11½ years) the pulse fluctuated so widely that rating could not be determined. Three children of the control group had been discharged from the home, and were not available when the test was given. Five enuretic and three nonenuretic children were less than 8 years of age.

1. Trentzsch, P. J.: Determination of Possible Psychotic Trends in Adolescence by a Modified Circulatory Rating Test, South. M. J. **18**:258, 1925.

Trentzsch considered ratings below 10 low for children between 10 and 15 years of age. It is to be noted that five of the nine enuretic children, on whom ratings could be obtained, rated below 10, whereas none of the nonenuretic children rated below 10. The range of scores is a higher one for the nonenuretic children (16 to 10 as compared with 13 to 1). It would appear that the enuretic children in this group presented evidence of less efficient circulatory systems than those of the nonenuretic control group.

TABLE 5.—*Results of Subjecting Enuretic and Nonenuretic Children to Circulatory Rating Test*

Enuretic Children				Nonenuretic Children			
Name	Sex	Age in Years (Closest Birthday)	Circulatory Rating	Name	Sex	Age in Years (Closest Birthday)	Circulatory Rating
J. O.	M	10	13	K. A.	M	12	16
H. S.	M	12	12	M. B.	F	9	15
B. R.	F	11	12	A. A.	M	10	14
R. S.	M	14	11	L. A.	M	11	13
G. O.	M	10	9	R. L.	M	12	13
O. O.	M	12	8	M. L.	F	8	11
L. A.	M	10	8	E. B.	F	13	11
E. B.	F	13	4	E. A.	M	13	10
F. H.	F	13	1	V. H.	F	10	10

TABLE 6.—*Specific Gravity of Day and Night Urine*

(a) Enuretic Children			(b) Nonenuretic Children		
Name	Day	Night	Name	Day	Night
E. B.	1.017	1.010	M. G.	1.026	1.022
H. S.	1.025	1.024	M. L.	1.018	1.015
H. O.	1.018	1.016	M. B.	1.020	1.017
F. H.	1.038	1.038	R. L.	1.024	1.026
O. O.	1.032	1.032	K. A.	1.020	1.023
J. S.	1.024	1.025	E. H.	1.018	1.022
C. S.	1.018	1.019	A. A.	1.022	1.025
V. S.	1.018	1.020	E. B.	1.022	1.032
J. O.	1.026	1.030	V. H.	1.017	1.024
G. O.	1.016	1.022	G. P.	1.025	1.030
R. S.	1.018	1.025	E. T.	1.015	1.027
R. O.	1.015	1.024			
L. A.	1.007	1.018			

Urinary Observations: Recently the fact [2] was emphasized that enuretic children may secrete a urine of lower specific gravity during the night than during the day. Twenty-four hour specimens of urine were collected. No distinctive relationship between decreased specific gravity of urine voided at night and enuresis could be determined. In only one case was there a markedly lower specific gravity of nocturnal urine; this child was enuretic. One boy was uncooperative on two attempts to obtain specimens, and five children were absent from the home at the time specimens were collected.

2. Friedell, Aaron: Reversal of Normal Concentration of Urine in Children Having Enuresis, Am. J. Dis. Child. **33**:717 (May) 1927.

Psychologic Observations.—All children were given the Stanford-Binet examination. The groupings of the intelligence quotients are shown in table 7.

The performance of the children of the nonenuretic group would appear to be slightly better, but in view of the small number of cases, no particular significance can be attached to these data. No outstanding differences were noted in the character of the performances. Three nonenuretic and five enuretic children were noted to be unreflective, or attention was only partially sustained. In all others a fairly consistent performance with good effort was noted.

Psychiatric Observations.—Individual interviews with all the children indicated certain differences in attitudes and in emotional reactions of the children of the two groups. There were a distinctly greater number of discrepant factors or situations revealed with the enuretic children than among the nonenuretic ones. Eight of the enuretic children revealed mentally conflicting situations in relation to their parents, the

TABLE 7.—*Results of Stanford-Binet Test*

Intelligence Quotient	Enuretic Group	Nonenuretic Group
70 to 79	1	2
80 to 89	6	4
90 to 99	4	3
100 to 109	2	5
110	2	1

enuresis, masturbation or their physical condition. In two of the nonenuretic children, similar conflicting situations were noted. One of these children gave evidence of inferiority feelings based on poor physique; the second was a child of borderline defective intelligence who had considerable insight into his deficiency. Marked egocentricity and suggestibility were noted among the children of the enuretic group, but not among those of the nonenuretic group. Particularly aggressive attitudes were noted among four of the enuretic children, but not among those of the control group. Psychopathy was suspected in one enuretic child.

Our observations would indicate that the control group is distinctly more stable emotionally, that they evidence neurosis to a lesser extent and that there are fewer widely divergent personalities among them.

TREATMENT AND RESULTS

Class Organization and Conduct.—The matrons had been accustomed to have the boys with the most severe cases of enuresis sleep on the floor on a rubber sheet, without mattresses. Some attempt was made at limiting fluid intake at 5 p. m. There were sporadic efforts at awakening the enuretic children at night. Wet sheets were washed out by the children. There was considerable scolding.

Treatment was begun by initial individual interviews with the children on the part of the psychiatric social worker. Most of the children agreed that enuresis was an annoyance, and that they should like to overcome the difficulty. The following week the worker met with boys and girls in separate groups. A small chart was provided for each child, on which he noted whatever efforts he had made in attempting to control enuresis, and whether he had wet the bed on the preceding night.

The children were advised (1) to drink little or no water after 5 p. m., (2) to restrict their activity after 4 p. m., (3) to go to the toilet at night on feeling the slightest inclination to void, (4) to attempt arising at regular hours at night to void and (5) to keep careful records of the daily progress by means of the charts. It was soon found that these charts were best kept when daily reports were made verbally to the matrons, who recorded results.

The matrons agreed to comment on dry nights only, and to encourage each child in his efforts. The larger boys, who had been sleeping on the floor, were gradually moved to beds. The practice of having the children care for their own wet sheets was not interfered with, but effort was made to shift the emphasis to the idea that this was reasonable cooperation rather than punishment. Certain of the matrons awakened the children at 11 p. m.

Class procedure consisted of bringing large weekly charts up to date in accordance with the child's own verbal report, and the daily record as kept by the matrons. There was informal talk concerning methods of preventing enuresis, and particularly, praise for effort. Failure to prevent wetting on the part of one of the older boys resulted in complaints against the weekly chart, and in this he was quickly followed by several others. He was cooperative only during the period of success. To this older group, particular emphasis was laid on the fact that class attendance was voluntary, and that they might see the worker alone. Eventually the weekly charts were discarded by all except the five younger children and one of the older girls.

During the final half of the period of twenty-two weeks of observation, the children, with two exceptions, spoke freely of the enuresis to the worker individually or in class. These two were among the unimproved. The five younger children, boys and girls, came to class together regularly, but meetings with the other took on a more casual form of individual interviews.

Outcome of Treatment.—Four of fifteen enuretic children treated in the manner already described were completely relieved of their difficulty. Of these, a girl, aged 7, who had wet the bed from one to five times weekly, remained free from enuresis following the onset of treatment. This was also true of a boy, aged 9, who previous to treatment had wet

the bed frequently. A third, a girl, aged 13, who had always been enuretic at least twice weekly, improved promptly, wetting the bed on only two occasions during the early part of the treatment. She was free from the difficulty fifteen weeks at the time of the last report. A fourth, a boy, aged 9, infrequently wet, was entirely free except for one night during the ninth week of treatment.

Seven children were improved, four of these markedly. Three children were unimproved during the last month of treatment, and one was more frequently enuretic than he had been previously. This was one of the older boys who rather early became resentful toward discussion of his difficulty.

In order to evaluate the effectiveness of the procedure in reduction of enuresis, the results were tabulated in terms of the number of times the children of the group wet the bed weekly. At the outset, the fifteen children wet at night fifty-five times each week. During the last month of observation, these same children wet the bed thirty-two times weekly. The reduction amounted to 42 per cent. Comparing younger and older children, we found that a reduction of 48 per cent was obtained in six children below 10 years of age, and a reduction of 37 per cent with the nine children 10 years of age or over.

CAUSATION OF ENURESIS

In every instance multiple factors must be considered. Attempts to limit causative factors to those apparently more significant in individual cases resulted as follows: poor training, ten; emotional factors, eight; suggestion, one; poor physique, three, and fatigue, one case.

All of these factors may be found in the nonenuretic group as well as in the enuretic group. The incidence among the enuretic group is sufficiently striking, however, to require careful consideration as etiologic factors. The absence of specific causative factors common to the whole group indicates further a likelihood of a constellation of factors.

Training.—In six cases it was known that the children never had learned to control the bladder. In five of these the general discipline of the home was known to be particularly lax, and in the sixth the parents were markedly unstable. In only two cases would parents definitely state that the control of the bladder had ever been established. It would appear that laxity in efforts to establish the dry habit is an important factor in these cases.

Physical Factors.—In only three cases were specific physical defects considered noteworthy. One of these was a poorly nourished child with a long tight foreskin; a second, in poor general state of nutrition, had a healed tuberculous lesion of the hip. He too had a tight foreskin. A third presented a distinctly poor and flabby musculature and an infected

and obstructed nasopharynx. In none of these were the physical discrepancies the only ones noted. On the part of one there was a distinct emotional reaction to his own poor physique, that is, feelings of inferiority on a physical basis. The enuresis itself constituted a conflicting situation for one, and the third came from a home included in those of poor training.

In thus limiting the rôle of specific physical defect as a causative factor for enuresis, it must be kept in mind, as elsewhere stated, that the children of the enuretic group as a whole were not in as good general physical condition nor in as good a state of nutrition as were the nonenuretic children. This situation is not apparent on inspection of the individual case, except in the cases just cited. Further, the evidence of relatively decreased cardiovascular efficiency, as demonstrated by the circulatory efficiency test, remains to be evaluated. An underlying vasomotor instability, or some actual anatomic peculiarity of the cardiovascular system, may be responsible for the impaired efficiency noted.[1] This evidence of circulatory impairment, with the noted poor general physique, poor nutrition and tendency to greater number of physical defects, may be indicative of underlying constitutional deficiencies of which enuresis is another expression. Unless further work produces evidences of peculiarities of the urinary system proper, physical factors in producing enuresis may be considered nonspecific and of the nature of underlying constitutional peculiarities.

In one case, that of a stable and physically and mentally well endowed adolescent girl, no discrepant factors could be elicited other than that she was overactive and probably chronically fatigued. The enuretic condition improved under a rest regimen instituted previous to our period of observation, and lapsed when the interested matron no longer insisted on the rest regimen. In this case it is possible that the child utilized the symptom to obtain especial attention from the matron.

Emotional Factors.—Ten of the children showed evidence of "mental conflict." Four of these were rather aggressive children in whom enuresis was considered of the nature of a revolt. It is to be noted that of these four, two are the children who presumably had not been enuretic before entering the home. A third had been in the home since infancy. The fourth had come from a relatively superior home of unstable character. In nine children, conflicting situations centered about the parents. Resentfulness toward parents on account of cruelty of the father, desertion by the mother and separation from the parents was noted. Other conflicting situations related to masturbation, physical and social inadequacy, the home proper and enuresis itself.

In one instance no significant factors could be found except that the boy was generally suggestible, that he was readily influenced by the

attitudes of other boys and that he became enuretic along with his brother. A tight foreskin may have been a possible factor.

The multiplicity and nonspecific character of etiologic factors in our cases of enuresis are consistent with the view of enuresis as a neurotic manifestation. It is possible that if children presenting almost any given neurotic symptom were subjected to study similar to the one reported, the observations would be similar. Etiologic factors range from purely physical to purely psychogenic, admixtures of both usually being found in the given case.

SUMMARY AND CONCLUSIONS

1. Fifteen enuretic children in a home were studied to determine: (*a*) causes of the enuresis, (*b*) response to a routine treatment in the home and (*c*) physical and mental differences between them and a group of fifteen nonenuretic children from the same home.

2. "Familial" enuresis is common among our group, several children in a family being enuretic. Some of the parents have been enuretic as well.

3. The principal factors in the production of enuresis among these children appeared to be: (*a*) poor training, (*b*) emotional factors, (*c*) physical factors, (*d*) suggestion and (*e*) fatigue.

4. Enuresis in our group is most frequently the result of poor training. Many enuretic children never have learned the dry habit. We noted two cases, however, in which the control of the bladder has been learned with subsequent onset of enuresis.

5. Physical comparison of the enuretic and control groups indicates that: (*a*) There is no relationship between specific physical defect and enuresis. (*b*) The enuretic children are in relatively poorer nutritional condition and of slightly inferior general physique. (*c*) The enuretic children have less efficient cardiovascular systems than the nonenuretic children, as measured by a cardiovascular efficiency test. (*d*) Physical differences between enuretic and nonenuretic children may be of the nature of constitutional variations.

6. We do not confirm reported reversal of normal relationship between concentration of urine voided during the day and that voided during the night in our limited number of cases.

7. Our enuretic children are emotionally less stable and betray a greater number of emotionally conflicting situations than do the nonenuretic children.

8. The variety and combinations of etiologic factors ranging from purely organic to purely psychogenic are in keeping with the view that enuresis is frequently a symptom of neurosis.

9. A procedure is described which resulted in complete relief from the enuretic condition in four of fifteen cases. Improvement occurred in seven others.

In terms of dry and wet nights, an improvement of 48 per cent was obtained among the younger children (ages 5 to 9 years) and 30 per cent among the older children (ages 10 to 14 years). The average improvement was 42 per cent.

10. Class procedure for control of enuresis is practicable and helpful among young children (aged 9 years and younger) in institutions of the character described.

11. A rational treatment of the individual enuretic patient will require careful diagnosis, evaluation of the various etiologic factors in the given case and a high degree of individualization in treatment.

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DEXTROSE TOLERANCE IN INFANTS AND IN YOUNG CHILDREN *

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The data available in the literature on dextrose tolerance in infancy are both meager and scattered (table 1). It is stated that the blood sugar curve of infants after ingestion of carbohydrate is similar to that of adults, but is flatter. However, the procedure followed and the technic employed in determining the curves of infants, with one or two exceptions, differ so widely from those employed in determining the sugar curves of adults that it hardly seems justifiable to compare the curves.

In 1914, Mogwitz [1] studied the tolerance of six infants between the ages of 4 and 13 months. In five cases, the level of the blood sugar was determined after the infant's ingestion of milk in such quantity that it received from 1 to 4 Gm. of lactose per kilogram of body weight. In the sixth case, that of an infant 11 months of age, the level of the blood sugar was estimated at frequent intervals for one hour after the ingestion of a 12 per cent solution of dextrose, 4 Gm. of dextrose being given for every kilogram of body weight. The blood sugar increased from 87 to 134 mg. per hundred cubic centimeters in one hour.

Bergmark,[2] also in 1914, studied the sugar tolerance of infants between the ages of 4 and 8 months after their ingestion of dextrose, lactose, saccharose, maltose and levulose. He determined the blood sugar curves of three after their ingestion of dextrose, the amount given varying from 7.8 to 20 Gm. The average maximal response was a rise to 128 mg. per hundred cubic centimeters in one hour.

In 1916, Niemann [3] determined the values of the blood sugar of thirty infants after their ingestion of various amounts of malt and lactose added to feedings of maize flour.

In 1920, Frank and Melhorn [4] studied the sugar tolerance of twenty-seven children under 3 years of age, following their ingestion of

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1. Mogwitz: Monatschr. f. Kinderh. **12**:569, 1914.
2. Bergmark: Jahrb. f. Kinderh. **80**:373, 1914.
3. Niemann, A.: Jahrb. f. Kinderh. **83**:1, 1916.
4. Frank, A., and Melhorn, L.: Jahrb. f. Kinderh. **91**:313, 1920.

TABLE 1.—*Summary of Literature on Alimentary Dextrose Tolerance in Infants and Young Children*

Author	Date	Cases	Age, Months	Condition	Sugar Given	Amount of Sugar Given	Method Used	Blood Sugar, Mg. per 100 Cc.		Time After Ingestion of Sugar When Maximal Value of Blood Sugar Was Obtained
								Fasting Value	Maximal Values	
Mogwitz	1914	5	4-13	Pathologic	Lactose in milk	1-4 Gm. per Kg. body weight	Bang	60- 87	124	½ hour
		1	11	Rickets	Dextrose, 12% solution	4 Gm. per Kg. body weight	Bang	87	134	1 hour
Bergmark	1914	3	4-8	1 normal, 2 pathologic	Dextrose dilution (1:6) with water	7.8-20 Gm.	Bang	80- 88	128	1 hour
		4	...	1 normal, 3 pathologic	Lactose	7.8-20 Gm.	Bang	83-105	92-128	½ hour
		4	...	1 normal, 3 pathologic	Saccharose	7.8-20 Gm.	Bang	78-110	98-170	½ hour
		2	...	1 normal, 1 pathologic	Maltose	7.8-20 Gm.	Bang	90- 98	130-142	½ hour
		3	...	1 normal, 2 pathologic	Levulose	7.8-20 Gm.	Bang	82- 95	99-107	½ hour
Niemann	1916	20	2-9	Pathologic	Maize flour feeding + malt	5-15 Gm. malt	Bang	70- 91	89-145	½-1 hour
		10	½-9	Pathologic	Maize flour feeding + lactose	10 Gm. lactose	Bang	66- 81	82-155	½-1 hour
Frank and Melhorn	1920	18	½-36	Pathologic	Saccharose	8 Gm. per Kg. body weight	Bang	68-104	175-200	½-1 hour
		1	12	Pathologic	Dextrose	8 Gm. per Kg. body weight	Bang	70	195	½ hour
		1	20	Pathologic	Levulose	8 Gm. per Kg. body weight	Bang	85	158	½ hour
		7	16-27	Pathologic	Starch	8 Gm. per Kg. body weight	Bang	83 (1)	147	3½ hours
								69- 95 (6)	140-152	½-1 hour
Mertz and Rominger	1921	2	Under 15	Normal	Dextrose	20 Gm.	Bang	92- 95	123-129	½-1 hour
		4	Under 15	Normal	Dextrose	50 Gm.	Bang	88-113	181-297	½-1½ hours
		19	Under 15	Pathologic	Dextrose	30 Gm.	Bang	60-120	153-309	½-1½ hours
		4	Under 6	Injury of the liver	Dextrose	30 Gm.	Bang	82-130	179-330	½-1½ hours
		1	3	Injury of the liver	Levulose	30 Gm.	Bang	136	302	1½ hours
Spence	1921	4	½-24	Normal	Lactose	7.5-15 Gm.	MacLean	80-112	110-160	½-1 hour
		1	6 days	Normal	80 cc. breast milk =	4 Gm. lactose	MacLean	88	112	½ hour
		1	4	Normal	100 cc. cow's milk + lactose =	9 Gm. lactose	MacLean	92	101	1 hour
		2	8-36	Normal	Saccharose	15-20 Gm.	MacLean	97- 98	117-152	½ hour
		3	1½-8	Normal	Dextrose	7.5-10 Gm.	MacLean	94- 98	110-141	½ hour
		2	2 yr.	1 normal 1 active rickets	Dextrose	15 Gm.	MacLean	105	141	½ hour
								83	161	1 hour
Rumpf	1924	..	....	.....	Dextrose	1.3 Gm. per Kg. body weight	....	76	104-135	8-36 min.
Brown	1925	10	1½-13	Normal	Dextrose	1 Gm. per Kg. body weight	MacLean	84-116	120-156	½-1 hour
		50	½-17	Pathologic	Dextrose	1 Gm. per Kg. body weight	MacLean	62-119	100-187	½-1 1½ hours

saccharose, dextrose, levulose and starch, the large amount of 8 Gm. of carbohydrate being given for each kilogram of body weight. Dextrose was given to one infant 1 year of age. The highest point in the blood sugar curve, 195 mg. per hundred cubic centimeters, was reached in half an hour.

In 1921, Mertz and Rominger [5] reported the blood sugar curves of twenty-nine infants under 15 months of age after their ingestion of from 20 to 50 Gm. of dextrose. The highest points in the curves, from 123 to 530 mg. per hundred cubic centimeters, were found in from one-half to one and one-half hours.

Spence,[6] in 1921, determined the tolerance of ten infants varying in age from 6 days to 3 years. Three infants received about 2 Gm. of dextrose for every kilogram of body weight, and two, 2 years of age, received 15 Gm. of dextrose. The maximal values of the blood sugar, ranging from 110 to 161 mg. per hundred cubic centimeters, were obtained in from one-half to one hour. He concluded that the sugar tolerance of children under 3 years of age is greater than that of adults, and that the tolerance of children over 3 years of age is the same as that of adults.

Rumpf,[7] in 1924, found that the smallest amount of dextrose which induced a distinct alimentary glycemia in infants was 1.3 Gm. per kilogram of body weight. A maximal amount of blood sugar of from 104 to 135 mg. per hundred cubic centimeters was obtained in from eight to thirty-six minutes.

Brown,[8] in 1925, did the best and most comprehensive work on the subject. One gram of dextrose for each kilogram of body weight was given, dissolved in the requisite amount of water to make a feeding of sufficient quantity for the age of the child. The tolerance of ten normal children was determined. This is the only work on the sugar tolerance of infants in which any appreciable number of normal infants were used as controls. The blood sugar reached maximal levels, varying from 120 to 156 mg. per hundred cubic centimeters, half an hour after the ingestion of the dextrose. In seven cases it regained the fasting level in two hours. The dextrose tolerance of fifty children with various pathologic conditions was studied. The author asserted that three with pyloric stenosis showed delayed absorption, and that one with congenital obliteration of the bile ducts showed the blood sugar well above the fasting level two and one-half hours after the ingestion of dextrose. All these had curves rather flatter than would be expected of blood from

5. Mertz, A., and Rominger, E.: Arch. f. Kinderh. **69**:81, 1921.

6. Spence, J. C.: Quart. J. Med. **14**:314, 1921.

7. Rumpf, F.: Jahrb. f. Kinderh. **105**:321, 1924.

8. Brown, A.: Quart. J. Med. **18**:175, 1925.

the finger, but the quantity of dextrose given was small, 1 Gm. per kilogram of body weight. The amount of dextrose usually given is 1.75 Gm. per kilogram of body weight.

TECHNIC

In all the work done on the dextrose tolerance of infants, the values of the blood sugar were estimated on blood from the finger, a micromethod being used. (This did not prove satisfactory in our hands. We found that in obtaining 0.1 cc. of blood from the finger, toe or heel of an infant, we caused much greater discomfort than by venipuncture.) However, in practically all the work done on the dextrose tolerance of adults, the values of the blood sugar were estimated on venous blood with a macromethod. That the results from the two methods are not comparable was pointed out by Foster.[9] He showed that, in the fasting condition, the concentrations of sugar in the finger, or arterial blood, and venous blood are the same within experimental error. After the ingestion of dextrose, however, the sugar in the blood of the finger rises to a much higher level than that in the venous blood. In all our cases, venous blood was used in making the determinations. The Myers-Bailey modification of the Lewis-Benedict method[10] was used. This method is, of course, much less liable to error than the micromethod and therefore to be preferred. The value of the sugar was estimated immediately after the withdrawal of the blood.

The routine used by Killian[11] was followed. From three to four hours after a light breakfast, consisting of a slice of toast and a cup of milk or, in the case of the younger infants, of milk alone, blood was taken and the value of the sugar estimated as a control. The test was done after a short fast, because prolonged fasting decreases the tolerance for sugar. (Moreover, protein ingested four hours before a test of dextrose tolerance exerts little or no influence on the blood sugar curve, but given eighteen hours previously, it greatly increased the tolerance [Du Vigneaud and Karr[12]].) Immediately after the blood was taken, 1.75 Gm. of dextrose per kilogram of body weight was given in 50 per cent solution, ruling out dilution as a variant. In the case of infants much under weight, the dextrose given was calculated on the normal weight for a child of that age. In no case was the amount of dextrose given less than 10 Gm. To make the dextrose palatable, it was flavored with a few drops of lemon juice. As the volume of this was small, it was readily taken in a few minutes and well tolerated.

By giving pure dextrose alone, we obviated any effect on the rise in blood sugar caused by a simultaneous ingestion of protein and fat with carbohydrate, such as obtains when dextrose is given in dilution with milk.

We realize that by hourly estimations of the value of the blood sugar we may have missed the high peaks of the curves, which occur sometimes during the first hour after the ingestion of dextrose, usually within the first half hour. We found this to be unessential; the determinations of the values every two hours in normal cases gave us a characteristic curve with which the curves in pathologic cases might be compared. No attempt was made to obtain the urine.

The technic employed exactly paralleled that used for adults and provided a fair basis on which to compare the two.

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9. Foster, G. L.: J. Biol. Chem. **55**:291, 1923.
10. Myers, V. C., and Bailey, C. V.: J. Biol. Chem. **24**:147, 1916.
11. Killian, J. A.: Proc. Soc. Exper. Biol. & Med. **17**:91, 1920.
12. Du Vigneaud, V., and Karr, W. C.: J. Biol. Chem. **66**:281, 1925.

NORMAL INFANTS

The dextrose tolerance of thirteen normal children under 3 years of age was determined (table 2). One was 5 weeks of age, five were between 12 and 18 months, six were 2 years and one was 2½ years.

The control determinations of the sugar in the blood from three to four hours after a light meal showed amounts of from 80 to 110 mg. per hundred cubic centimeters. One hour after the ingestion of the dextrose ten infants showed the blood sugar increased to between 120 and 142 mg. per hundred cubic centimeters, an increase of from 28 to 50 per cent over the control determinations. Two hours after the ingestion of the dextrose these patients showed blood sugar between 92 and 130 mg. per hundred cubic centimeters, an increase of from 10 to 27

TABLE 2.—*Dextrose Tolerance Curves in Normal Infants*

				Blood Sugar, Mg. per 100 Cc.			Blood Chloride, Mg. per 100 Cc.		
Case	Sex	Age	Body Weight, Gm.	Control	1 Hour After Ingestion of Dextrose	2 Hours After Ingestion of Dextrose	Control	1 Hour After Ingestion of Dextrose	2 Hours After Ingestion of Dextrose
162	M	5 wk.	2,825	89	101	117	...	...	...
107	F	1 yr.	8,750	97	125	107	525	538	513
108	F	15 mo.	11,200	92	126	117	550	525	525
97	M	16 mo.	9,900	101	141	109	525	513	525
104	M	16 mo.	9,150	81	128	128	525	525	525
133	F	18 mo.	10,500	109	140	103	...	...	...
101	M	2 yr.	11,020	103	132	92	513	500	513
134	F	2 yr.	11,818	99	139	96	...	...	...
99	M	2 yr.	11,810	110	142	130	525	538	525
112	M	2 yr.	11,600	80	120	101	...	...	...
118	F	2 yr.	10,570	90	104	127	550	550	525
100	M	2 yr.	11,600	97	124	103	...	...	...
119	F	30 mo.	11,970	103	136	129	525	525	525
Average				96	128	113			

per cent over the controls. In the remaining three infants there was a decided lag. In one, the blood sugar, two hours after the ingestion of dextrose, amounted to 128 mg. per hundred cubic centimeters, exactly the same as after one hour. In the other two, it reached higher levels two hours after ingestion of dextrose than it did one hour after ingestion (117 and 127 mg. per hundred cubic centimeters as compared with 101 and 104 mg.). This lag seemed to be of common occurrence. In six of thirteen normal infants, the blood sugar had not returned to normal (80 to 110 mg.) at the end of two hours. The average increase one hour after ingestion of dextrose was 32 mg., and two hours after, it was 17 mg. This gave a curve for normal infants slightly flatter than the curve for normal adults determined in the same way (chart 1).

SICK INFANTS

The dextrose tolerance of ninety-seven children from 3 months to 5 years of age with various pathologic conditions was determined.

The carbohydrate metabolism of five marasmic and eight undernourished children was studied (table 3). By marasmus is meant a gradual loss of weight or failure to gain in weight which develops without general or local organic disease. A child less than 90 per cent of the normal weight for its age is called undernourished. The five marasmic infants were between 4 and 10 months of age and weighed from 43 to 64 per cent of their normal weights. Diarrhea was not present in any case. One of these infants gave a normal blood sugar curve, while the other four showed decreased tolerance. This is contradictory of the

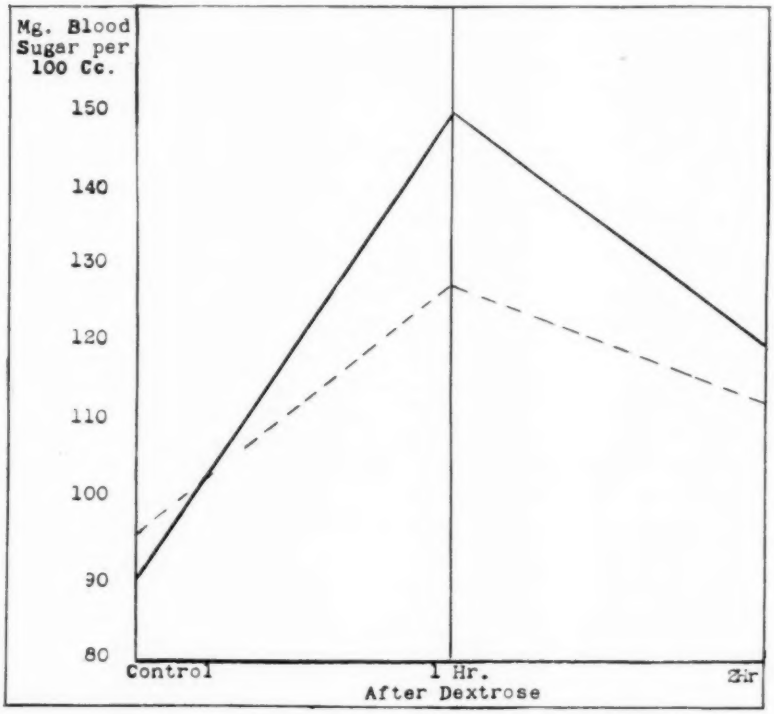

Chart 1.—A comparison of the alimentary dextrose tolerance of children under 3 years of age (broken line), as compared with that of adults (solid line).

recent statement of Tisdall, Drake and Brown [13] that the marasmic infant digests and absorbs carbohydrate in a normal manner.

The eight undernourished children, who were normal in all other respects, were between 19 months and 3 years of age and weighed from 72 to 89 per cent of their normal weights. Normal sugar curves were obtained in seven of these cases, while one showed decreased tolerance.

13. Tisdall, F. F.; Drake, T. G. H., and Brown, A.: Carbohydrate Metabolism of Normal Infant, Am. J. Dis. Child. **30**:675 (Nov.) 1925.

TABLE 3.—*Dextrose Tolerance Curves in Marasmic and Undernourished Infants*

Case	Sex	Age	Body Weight, Gm.	Per Cent of Normal Weight	Blood Sugar, Mg. per 100 Cc.			Blood Chloride, Mg. per 100 Cc.		
					Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose	Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose
Marasmic Infants										
47	F	10 wk.	2,675	43	57	134	123	...	...	...
65	M	6 mo.	4,100	56	79	220	211	500	475	475
27	M	6½ mo.	4,240	58	86	159	113	...	...	...
31	M	8 mo.	5,075	64	79	114	87	...	...	...
114	M	10 mo.	4,750	57	103	165	173	(Congenital absence of rectus muscle)		
Undernourished Children										
102	F	16 mo.	8,500	87	99	125	134	525	550	525
109	M	23 mo.	9,800	83	83	135	122	...	...	...
130	M	2 yr.	9,310	77	97	125	120	...	...	...
132	M	2½ yr.	10,400	80	86	115	94	...	...	...
43	M	2½ yr.	9,760	74	103	132	123	525	550	525
131	M	2¾ yr.	10,000	72	101	131	97	...	...	...
137	F	3 yr.	11,100	79	88	166	117	...	...	...
129	M	3¼ yr.	11,400	77	110	155	128	...	...	...

TABLE 4.—*Blood Sugar Curves Following Ingestion of Dextrose in Infants with Tetany*

Case	Sex	Age	Body Weight, Gm.	Blood Sugar, Mg. per 100 Cc.			Blood Chloride, Mg. per 100 Cc.			Blood Calcium and Phosphorus, Mg. per 100 Cc.		Associated Conditions
				Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose	Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose	Ca	P	
74	M	3 mo.	3,675	74	85	90	...	...	...	7.6	4.1	Dermatitis seborrheica
72	F	4 mo.	3,830	114	121	94	513	538	525	6.8	3.8	Mongolian idiocy
153	F	7 mo.	3,830	121	127	113	...	...	...	6.4	2.4	Marasmus, bronchitis
154	M	13 mo.	7,360	97	107	97	...	...	...	6.0	2.1	
23	F	14 mo.	6,275	97	94	86	525	525	525	5.4	3.9	Acute otitis media
171	F	17 mo.	4,860	121	120	124	...	...	...	5.8	4.0	9/30, C.L.O.; five fractures demonstrated by x-ray; calcium chloride, 10 grains three times a day
				107	130	123	...	...	...	8.1	5.4	10/25, bronchopneumonia
				113	128	115	...	...	...	9.7	6.4	11/30, x-rays showed considerable formation of new bone; fractures apparently healed
				113	150	132	...	...	...	11.6	5.5	1/31
180	F	9 mo.	.....	112	134	144	...	...	...	6.9	4.1	
182	M	9 mo.	4,025	91	132	114	...	...	...	7.3	2.5	Meningism, pneumonia
158	M	3 mo.	4,685	108	137	135	...	...	...	6.9	4.2	Bronchopneumonia
57	F	5 mo.	5,665	92	130	111	513	525	500	6.0	2.3	

This agrees with the work of Brown, who found that after the ingestion of dextrose "the curve is identical in the normal and the undernourished child." Brown,[8] however, did not distinguish between the marasmic and the undernourished child, but defined a marasmic infant as one who weighs less than 80 per cent of the normal weight for his age irrespective of the cause. She stated, therefore, that the dextrose tolerance of the marasmic infant is normal.

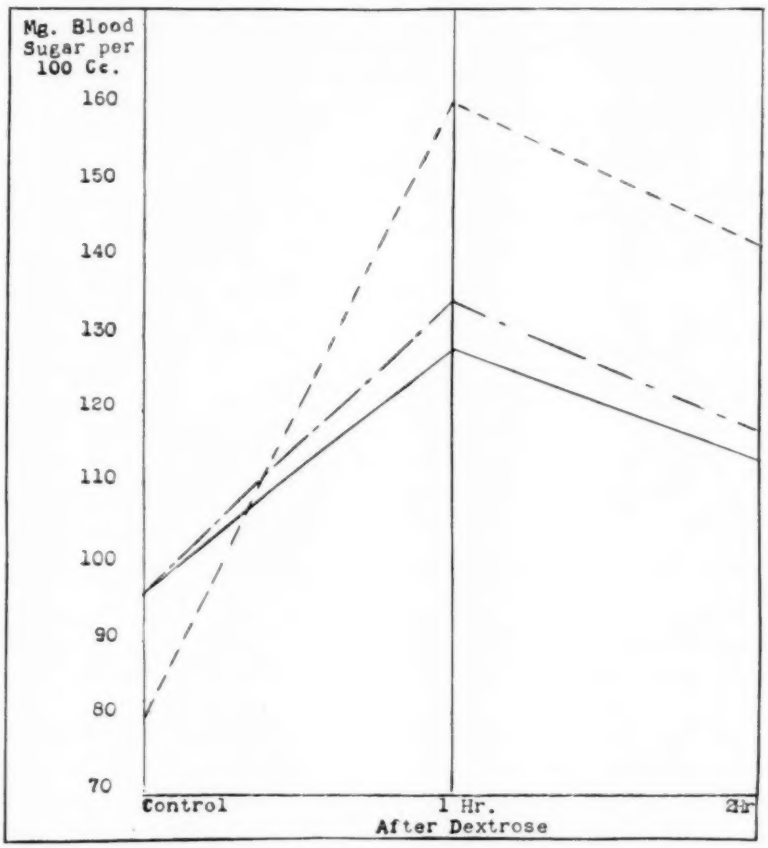

Chart 2.—A comparison of the alimentary dextrose tolerance of marasmic children (broken line) and of undernourished children (dot dash line), as compared with that of normal children (solid line).

Ten infants with tetany were studied (table 4). Four showed normal tolerance, the other six increased tolerance. The association of a disturbance in carbohydrate metabolism with tetany and parathyroid deficiency has been pointed out by several investigators.[14] The facts

14. Schierbeck, N. J.: Acta. paediat. **6**:110, 1926.

reported, however, are somewhat contradictory so that no final conclusion can be drawn. The subject awaits further investigation.

The tolerance of five infants with epidemic encephalitis was studied during the acute stage of the disease (table 5). Two showed normal tolerance and three increased tolerance. Kasanin and Grabfield [15] studied the dextrose tolerance of eight children over 3 years of age and of nine adults in the postencephalitic stage. The eight children showed increased tolerance, while the nine adults showed decreased tolerance.

The blood sugar of nine infants who had generalized tuberculosis was estimated after the ingestion of dextrose. Two without involvement of the meninges gave normal curves. The other seven were suf-

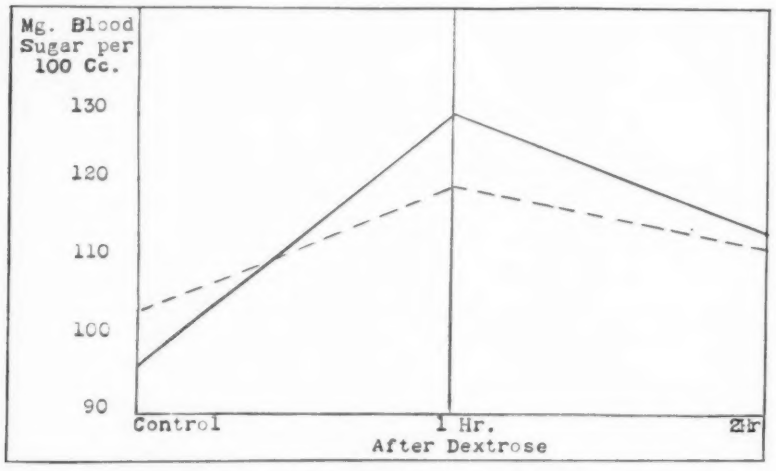

Chart 3.—The alimentary dextrose tolerance of infants with tetany (broken line), as compared with that of normal infants (solid line).

fering from tuberculous meningitis. For one of these, whose tolerance was determined twelve days before death, a normal curve was obtained. The other six showed decreased tolerance. The breakdown in carbohydrate metabolism seemed to progress as death approached. In one infant, a marked decrease in dextrose tolerance was found on the second day preceding death, while in another infant a typical diabetic sugar curve was obtained three hours before death (table 5).

The dextrose tolerance of five children with other lesions of the nervous system and of seven with psychic disorders was determined. Of these, six gave normal curves and six showed decreased tolerance (table 6).

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15. Kasanin, J., and Grabfield, G. P.: Blood Sugar Curves in Epidemic Encephalitis, Arch. Int. Med. **37**:102 (Jan.) 1926.

TABLE 5.—*Blood Sugar Curves Following Ingestion of Dextrose*

Case	Sex	Age	Body Weight, Gm.	Blood Sugar, Mg. per 100 Cc.			Blood Chloride, Mg. per 100 Cc.			Spinal Fluid Sugar, Mg. per 100 Cc.	Remarks
				Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose	Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose		
Epidemic Encephalitis											
93	M	2 yr.	10,530	101	112	81	...	...	...	59	
128	M	2 yr.	13,885	94	119	122	...	...	...	59	
160	M	3 yr.	13,020	101	131	104	...	...	...	74	
142	M	3½ yr.	11,225	93	101	100	...	...	...	77	
150	M	4 yr.	14,840	108	119	103	500	500	500	71	
Tuberculosis											
124	M	6 mo.	5,225	104	131	140	...	...	...	..	(Generalized, no involve-
3	F	3½ yr.	11,900	87	154	136	...	...	...	..	) ment of meninges
Tuberculous Meningitis											
14	F	27 mo.	10,430	91	147	108	...	...	...	28	12 days antemortem
113	M	3 mo.	4,630	120	156	155	...	...	...	49	10 days antemortem
76	F	18 mo.	9,780	121	135	158	500	475	513	41	7 days antemortem
32	F	2½ yr.	8,875	157	248	248	...	...	...	52	2 days antemortem
35	M	2 yr.	12,600	187	363	333	...	...	...	22	5 hours antemortem
126	F	18 mo.	9,240	121	176	130	...	...	...	39	Ill 2 weeks; death ?
125	F	14 mo.	7,800	131	170	156	...	...	...	19	Ill 2 weeks; death ?

TABLE 6.—*Blood Sugar Curves Following Ingestion of Dextrose in Patients Showing Lesions of the Nervous System and Psychic Disorders*

Case	Sex	Age	Body Weight, Gm.	Blood Sugar, Mg. per 100 Cc.			Blood Chloride, Mg. per 100 Cc.			Diagnosis
				Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose	Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose	
Nervous Diseases of Unknown Origin										
117	F	22 mo.	10,950	78	165	163	...	...	...	Infantile convulsions of unknown origin
78	F	26 mo.	9,700	97	119	135	525	538	525	Sydenham's chorea
Defective and Psychopathic States										
146	M	8 mo.	9,000	92	210	122	...	...	...	Idiocy; optic atrophy
16	F	14 mo.	6,450	90	174	113	...	...	...	Idiocy
152	M	28 mo.	8,550	120	135	118	...	...	...	Neuropathic child
138	M	2 yr. 10 mo.	17,500	90	120	110	...	...	...	Idiocy
13	M	4 yr. 5 mo.	14,200	115	181	160	...	...	...	Constitutional inferiority
Brain and Cerebral Meninges										
29	M	6 mo.	5,760	140	210	201	...	...	...	Chronic hydrocephalus; test done immediately before death
92	F	11½ mo.	8,300	95	130	114	513	513	513	Acute anterior poliomyelitis, convalescent
56	M	23 mo.	10,900	103	116	135	525	550	538	Glioma of brain
73	F	4½ yr.	13,850	99	145	129	...	...	...	Spastic paraplegia; birth injury, cerebral hemorrhage
71	M	5 yr.	12,025	100	160	140	575	563	563	Idiopathic epilepsy; constitutional inferiority; hypertrophy of tonsils
(Ten days after first test)				93	100	108	513	500	525	Two days after tonsillectomy

The dextrose tolerance of twenty-four infants with various types of infections in the acute and in the convalescent stage was determined (table 7). Of seventeen infants with infections in the acute stage (otitis media, bronchopneumonia, tonsillitis, arthritis and measles), ten

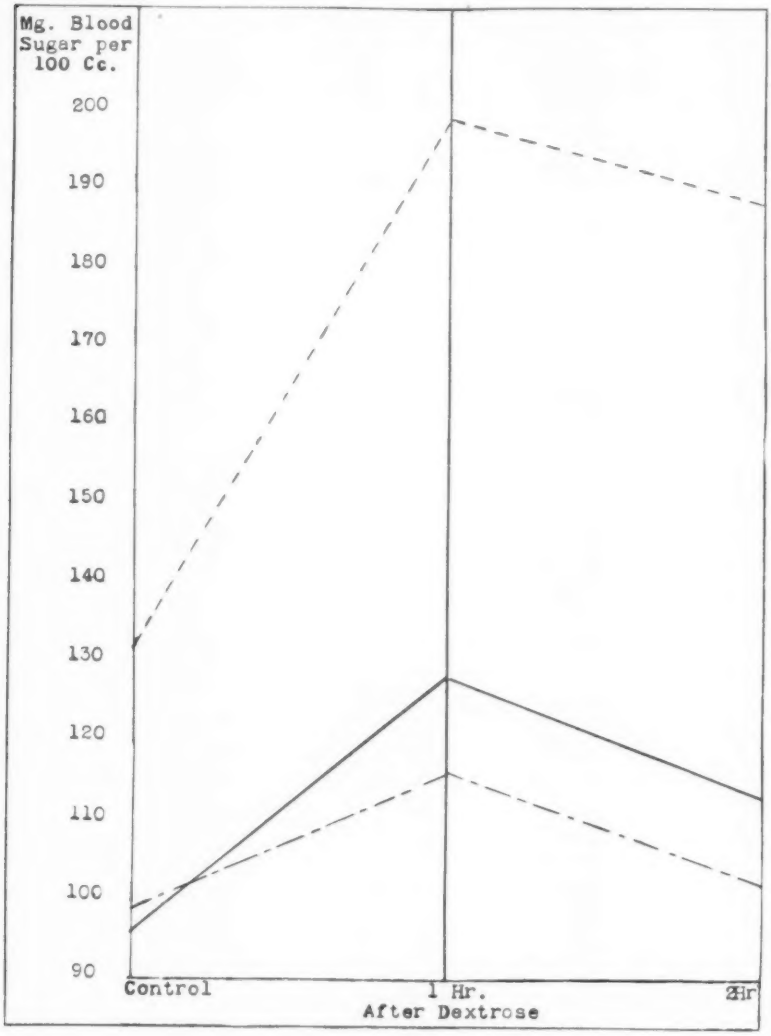

Chart 4.—The alimentary dextrose tolerance of infants with tuberculous meningitis (broken line) and of infants with epidemic encephalitis (dot dash line), as compared with that of normal infants (solid line).

showed normal tolerance, six increased tolerance and one decreased tolerance. Seven infants convalescent from infections showed normal tolerance. Body temperature seemed to bear no causal relationship to

TABLE 7.—*Blood Sugar Curves Following Ingestion of Dextrose in Infants and Children with Infections*

Case	Sex	Age	Body Weight, Gm.	Blood Sugar, Mg. per 100 Cc.			Blood Chloride, Mg. per 100 Cc.			Body Temperature, F.	Diagnosis
				Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose	Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose		
				Convalescent Stage							
88	F	3 yr.	13,500	98	135	101	488	488	475	99	Tonsillitis, blepharitis
89	F	4½ yr.	15,500	89	159	127	488	488	500	98.6	Tonsillitis, blepharitis; acute superficial cervical lymphadenitis
64	M	20 mo.	8,100	104	139	99	525	500	525	.....	Hypertrophy of tonsils; secondary anemia; caries of teeth
49	F	13 mo.	8,640	88	113	86	...	...	...	.....	Hypertrophy of tonsils; acute pharyngitis
86	F	33 mo.	10,500	96	113	117	550	500	500	.....	Acute pharyngitis; pyuria
19	F	2 yr.	10,700	78	131	89	...	...	...	.....	Serofibrinous pleurisy; rickets
148	M	9 mo.	.....	72	105	135	...	...	...	.....	Acute catarrhal colitis
				Acute Stage							
139	F	8 mo.	11,015	93	102	101	500	525	500	102	Bronchopneumonia
38	F	7 mo.	4,830	91	133	114	...	...	...	98	Bronchopneumonia; acute vaginitis
52	F	4 mo.	3,210	84	103	89	...	...	...	97.4	Bronchopneumonia; otitis
151	M	13 mo.	6,900	117	148	136	...	...	...	101.2	Bronchopneumonia; otitis; scorbutus; external hemorrhagic pachymeningitis
41	M	3 yr.	10,750	106	136	120	...	...	...	98.6	Rhinitis; otitis
144	M	2 yr.	12,400	89	125	103	...	...	...	98.8	Otitis; scarlet fever; abscess of anal region
115	M	6 wk.	2,635	84	98	126	...	...	...	97	Otitis
81	M	3 mo.	4,275	92	106	137	...	...	...	.....	Otitis
66	F	9 mo.	6,640	111	109	112	488	488	488	99.4	Otitis; panopthalmitis; abscess on back
18	M	3½ yr.	13,000	93	121	111	525	525	525	.....	Tonsillitis
77	M	34 mo.	11,075	117	155	132	500	500	500	103.8	Tonsillitis; acute nephritis
106	F	13 mo.	6,000	87	81	83	538	538	538	97.6	Malnutrition; incubating measles
98	M	2 yr.	10,200	112	124	97	...	...	...	99	Malnutrition; incubating measles; prolapse of rectum
103	F	19 mo.	9,200	83	176	101	538	525	525	97	Incubating measles; malnutrition
50	F	9 mo.	7,850	104	120	113	...	...	...	101	Suppurative arthritis; acute gonococcal vaginitis
48	M	27 mo.	.....	91	129	131	...	...	...	98.4	Chronic arthritis of hip joint
67	F	5 mo.	6,700	94	143	115	525	550	525	102.2	Bacillary dysentery

the disturbance of carbohydrate metabolism. Of nineteen infants with normal temperatures, one showed decreased tolerance, five increased and fourteen normal tolerance. Of five with increased temperature, three presented normal tolerance and two increased tolerance.

Three children with diabetes mellitus gave high, prolonged curves. Seven infants with other endocrine dyscrasias gave decidedly abnormal curves, four showing increased and three decreased tolerance. One

TABLE 8.—*Blood Sugar Curves Following Ingestion of Dextrose*

Case	Sex	Age	Body Weight, Gm.	Blood Sugar, Mg. per 100 Cc.			Blood Chloride, Mg. per 100 Cc.			Remarks
				Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose	Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose	
				Endocrine Dyscrasia						
178	F	2½ mo.	2,455	58	89	146	...	...	...	Athyreosis; died; thyroid, 9 grains, given four times a day
174	M	1 yr.	4,855	89	138	131	...	...	...	Infantile myxedema; thyroid, 9 grains, given four times a day
5	F	5 yr.	15,000	93	104	88	...	...	...	Myxedema goiter; congenital atresia of vagina
1	F	14 mo.	15,000	120	128	120	...	...	...	11/5/23, macroglossia
			17,200	100	101	129	...	...	...	3/28/24, after pituitary therapy
36	M	3 yr.	23,080	130	131	123	...	...	...	Precocious puberty; tumor of suprarenal gland
155	F	4 yr.	17,140	116	218	151	...	...	...	Precocious puberty
9	F	3 yr.	16,700	120	124	131	...	...	...	Unclassified
2	M	5 yr.	23,600	111	208	78	...	...	...	Unclassified
				Diabetes Mellitus						
163	M	3 yr.	14,400	258	362	374	...	...	...	
123	F	4 yr.	12,900	214	441	420	...	...	...	
96	M	4 yr. 10 mo.	14,375	63	369	286	475	475	475	
				Cases of Difficult Feeding						
91	F	6 mo.	4,440	91	129	111	475	475	475	Acute intestinal intoxication; condition good; ready for discharge from hospital
58	F	11 mo.	7,140	77	208	91	550	475	500	
40	M	14 mo.	6,350	91	103	93	...	...	...	4/28/25
			6,500	93	129	86	500	513	513	7/4/25, condition good; gaining weight normally
159	F	2 yr.	6,105	117	129	151	...	...	...	

child on whom the test was repeated after the administration of pituitary gland showed a curve more closely approaching normal. The dextrose tolerance of two cretinoid infants who had been receiving thyroid medication for some time was determined. One gave a normal curve, while the other showed decreased tolerance (table 8).

The blood sugar curves after the ingestion of dextrose were determined in four cases of difficult feeding (table 8). One child with acute intestinal intoxication was in good condition at the time the test was carried out and was about to be discharged from the hospital. The curve was normal. A second patient showed increased tolerance, but

when his condition improved and while he was gaining weight normally a repetition of the test gave a normal curve. The third infant showed decreased tolerance, while the fourth gave a curve that was normal. Of two children with xeroderma pigmentosum, one showed normal tolerance and one increased tolerance. One child with catarrhal jaundice showed decreased tolerance (table 9).

Infants with various other pathologic conditions (scurvy, anemia and lead poisoning) gave normal curves (table 9).

The values of the blood chloride were determined with the values of the blood sugar in forty cases in order to determine just what part

TABLE 9.—*Blood Sugar Curves Following Ingestion of Dextrose in Miscellaneous Conditions*

				Blood Sugar, Mg. per 100 Cc.			Blood Chloride, Mg. per 100 Cc.			
Case	Sex	Age	Body Weight, Gm.	Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose	Control	1 Hr. After Ingestion of Dextrose	2 Hr. After Ingestion of Dextrose	Diagnosis
80	M	1 yr.	4,090	126	205	165	...	...	...	Dwarfism; congenital absence of finger; congenital cubitus varus
157	M	4 yr.	13,600	94	120	142	...	...	...	Congenital malformation of spine
176	F	4½ yr.	.....	107	110	94	...	...	...	Xeroderma pigmentosum; three tumor masses on face
175	F	20 mo.	8,700	100	125	110	...	...	...	Xeroderma pigmentosum
169	M	3½ yr.	16,020	80	201	144	...	...	...	Catarrhal jaundice
6	M	3 yr.	9,654	80	147	119	...	...	...	Poisoned by lead
28	F	17 mo.	9,300	86	103	125	...	...	...	Cavernous hemangioma of nose
94	M	15½ mo.	10,080	106	153	113	525	525	538	Hemorrhage from rectum
135	F	3½ yr.	13,890	86	135	127	...	...	...	Cardiac decompensation
87	M	1 yr.	6,580	91	117	117	500	500	525	Infantile scorbutus

dilution of the blood played in determining the blood sugar curve after the ingestion of dextrose. The method of Myers and Short [16] was used. No constant variation in the level of the blood chloride was found to be associated with a definite type of sugar curve.

SUMMARY

1. The dextrose tolerance of thirteen normal infants was greater than that of normal adults. The average amount of sugar in the blood determined from three to four hours after a light meal was 96 mg. per hundred cubic centimeters; the average amount one hour after the ingestion of dextrose was 128 mg., and two hours after it was 113 mg.

2. The majority of infants (4 of 5) with marasmus showed decreased tolerance, while infants who were undernourished but not marasmic gave normal curves.

16. Myers, V. C., and Short, J. J.: J. Biol. Chem. **44**:47, 1920.

3. The majority of infants (6 of 10) with tetany showed increased tolerance.

4. The majority of infants (3 of 5) with epidemic encephalitis showed increased tolerance.

5. Seven infants with tuberculous meningitis presented a decreased tolerance for dextrose, which became more marked as death approached. Two infants with generalized tuberculosis without meningitis showed normal tolerance.

6. Infants with other nervous disorders showed normal tolerance in 50 per cent of the cases studied (6 cases); those who showed any deviation from the normal showed decreased tolerance (6 cases).

7. Seven infants convalescent after infection presented normal tolerance. Seventeen infants with infections in the acute stage revealed no consistent change in carbohydrate metabolism. Ten showed normal tolerance, six increased and one decreased tolerance. There was no definite relationship between the body temperature and the tolerance for dextrose.

8. Three children with diabetes mellitus showed markedly decreased tolerance.

9. Seven children with other endocrine dyscrasias gave abnormal curves.

10. There were no constant variations in the level of the blood chloride associated with a definite type of sugar curve.

VITAMIN B REQUIREMENTS IN INFANCY*

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The infant of today as a routine receives cod liver oil and orange juice, which furnish him with liberal amounts of vitamin A, C and D. Vitamin B is supplied in small amounts in both breast and cow's milk and in somewhat larger quantities when orange juice is also given. At no time is a substance rich in vitamin B given to the infant when he needs it most, that is, at the age when growth is greatest and when his diet is most limited.

The normal child develops and grows rapidly during the first year, and most rapidly during the first three months. By the end of the fourth month, the infant has usually doubled his weight, and has tripled it by the end of the first year.[1] It is obvious that during this period the infant should receive every substance conducive to optimal growth and development.

McCollum and Simmonds [2] stated with regard to the normal versus the optimal nutrition:

> The tendency of those who have investigated the relation of the diet to disease has been to assume that a diet which does not lead to clinically recognizable symptoms of malnutrition is an adequate one. Now that we understand so much about the nutritive needs of the body and about the properties of food-stuffs we appreciate the existence of many grades of malnutrition. It is becoming constantly more evident that even a slight departure from the optimal in the composition of the food may lead to states of nutritional instability which become contributing factors to physical breakdown when hygienic factors are unfavorable, or when infectious processes are operating. Even under the most favorable living conditions, however, there can be little doubt that under such circumstances the body tissues lose their vitability and the span of life tends to shorten.

The studies of Goldberger, Wheeler, Lillie and Rogers,[3] Chick and Roscoe,[4] Sherman and Axtmayer [5] and recently those of Hunt [6] have

* Submitted for publication, Dec. 5, 1928.

* From the Department of Pediatrics, Vanderbilt University School of Medicine.

1. Holt and Howland: The Diseases of Infancy and Childhood, ed. 9, New York, D. Appleton & Company, 1927, p. 13.

2. McCollum and Simmonds: The Newer Knowledge of Nutrition, ed. 3, New York, The Macmillan Company, 1925, p. 229.

3. Goldberger, J.; Wheeler, G. A.; Lillie, R. D., and Rogers, L. M.: A Further Study of Butter, Fresh Beef, and Yeast as Pellagra Preventives with Consideration of the Relation of Factor P-P of Pellagra (and Black Tongue of Dogs) to Vitamin B, Pub. Health Rep. **41**:297, 1926.

4. Chick, H., and Roscoe, M. H.: On the Composite Nature of the Water-Soluble B Vitamin, Biochem. J. **21**:698, 1927.

5. Sherman, H. C., and Axtmayer, J. H.: A Quantitative Study of the Multiple Nature of Vitamin B, J. Biol. Chem. **75**:207 (Oct.) 1927.

6. Hunt, C. H.: The Complex Nature of Vitamin B as Found in Wheat and Corn, J. Biol. Chem. **78**:83 (June) 1928.

demonstrated that vitamin B is composed of at least two components, the first of which is thermolabile and prevents polyneuritis, and the second of which is thermostable and prevents experimental pellagra and induces growth when given with the antipolyneuritic factor.

During the first four months of life the infant of today receives only the amounts of vitamin B contained in his mother's milk or in cow's milk, and in orange or fruit juices, which are added as adjuvants to the diet for their content of vitamins other than B.

The vitamin B content in breast and cow's milk has been studied by several investigators.

Hoobler, Macy and Outhouse [7] showed that relatively large amounts of breast milk were necessary to supply the amounts of vitamin B required by growing rats in comparison with the amounts of milk necessary to furnish adequate amounts of vitamin A. From this fact, they assumed that breast milk was fairly poor in vitamin B. They found that a daily intake of 2 cc. of breast milk prevented experimental xerophthalmia in rats, while at least from 30 to 35 cc. was needed to give approximately normal growth.

Macy, Outhouse, Graham and Long [8] went farther and gave autoclaved yeast to a few rats that had ceased to grow on a large quantity of breast milk and found that there was a definite response in increased growth. They concluded that growth was not optimal on large amounts of human milk in the absence of some substance which is found in yeast that is definitely not concerned with the antipolyneuritic vitamin. In addition, they suggested that substances rich in vitamin B should be introduced early in the infant's nursing period, whether the infant is breast fed or artificially fed.

Outhouse, Macy, Brekke and Graham [9] found that cow's milk was comparable with breast milk in that it contained but little vitamin B, and that fairly large amounts had to be fed to rats to produce growth. They observed that with the gradual increase of the intake of milk there was a commensurate intake of the basal ration. Even with large amounts of raw cow's milk in the diets the growth of the animals came to an end after about twelve weeks. If fresh dried yeast was fed daily at this time, there was an immediate response in growth.

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7. Hoobler, B. R.; Macy, I. G., and Outhouse, Julia: Tr. Am. Pediat. Soc. **38**:38, 1926.

8. Macy, I. G.; Outhouse, Julia; Graham, Alice, and Long, M. Louisa: Human Milk Studies: III. The Quantitative Estimation of Vitamin B, J. Biol. Chem. **73**:189 (May) 1927.

9. Outhouse, Julia; Macy, I. G.; Brekke, Viola; Graham, Alice: Human Milk Studies: IV. A Note on the Vitamin A and B Content of Cow's Milk. J. Biol. Chem. **73**:203 (May) 1927.

Osborne and Mendel [10] found that the vitamin B requirements of the rat increased with increased growth. Their animals on certain daily amounts of brewer's yeast would grow for a period and then growth would come to a standstill. For continued growth, an increase in the amount of brewer's yeast was necessary.

Various substances have been used and studied as a source of vitamin B. Karr [11] in his experimental diets used brewer's yeast, baker's yeast, tomatoes and milk as sources of vitamin B. He found that brewer's yeast was much more potent than baker's yeast, tomatoes or milk as a source of the growth-promoting factor in vitamin B. Weston has used a cereal mixture composed of selected wheat, rice, yellow corn and oats as a source of vitamin B.[12]

In spite of the amount of experimental evidence that vitamin B in large amounts is required in the diets of animals to secure optimal growth and development, there has been little attempt to show whether this holds true in the case of infants. Hess [13] reported the cases of some children to whom he fed brewer's yeast in an attempt to ascertain its value as an antiscorbutic, and in whom he observed that there was a stimulation of the appetite and an increase in growth. Accordingly, I undertook this study to determine whether or not the infant during his first two years of life needs a greater amount of vitamin B than is normally supplied to him through his milk and accessory food products.

EXPERIMENTS

Four premature infants and thirty other infants, comprising new-born infants and those up to 2 years of age, were given daily amounts of brewer's yeast in this hospital from Aug. 5, 1928, until Nov. 20, 1928. Their rate of gain and development was compared with that of twenty-five infants admitted immediately preceding them and with twenty-five infants who were in the hospital during August, September, October and November, 1927. With the exception of the premature and new-born infants, the majority of the patients were admitted to the hospital because of undernutrition or for regulation of feeding or for some infection of the upper respiratory tract.

The brewer's yeast used in this study was put up by a commercial house. The amounts fed varied with the weights of the children. One

10. Osborne, T. B., and Mendel, L. B.: The Rôle of Vitamin B in Relation to the Size of Growing Rats, J. Biol. Chem. **63**:233 (March) 1925.

11. Karr, W. G.: Some Effects of Water-Soluble Vitamin upon Nutrition, J. Biol. Chem. **44**:255 (Nov.) 1920.

12. Weston, William: Studies in Nutrition: II. Consideration of the Food Elements, Arch. Pediat. **43**:713, 1926.

13. Hess, A. F.: Infantile Scurvy: The Therapeutic Value of Yeast and of Wheat Embryo, Am. J. Dis. Child. **13**:98 (Jan.) 1917.

part by volume of the dried brewer's yeast was mixed with two parts of water, and this mixture was given in the following amounts twice daily: 1 cc. twice daily to infants weighing up to 4 pounds (1.8 Kg.); 2 cc. twice daily to those weighing from 4 to 8 pounds (3.6 Kg.); 4 cc. twice daily to those weighing from 8 to 12 pounds (5.4 Kg.), and 8 cc. twice daily to those weighing from 12 to 25 pounds (11.3 Kg.).

Premature Infants.—All infants whose birth weights were under 5 pounds (2.3 Kg.) were arbitrarily classified as premature infants. In this study, only the premature infants born in the hospital or those who were admitted to the hospital within the first twenty-four hours after birth have been included. The method of feeding, the formulas and the calories per kilogram were approximately the same for all. Premature infants received from 150 to 230 calories per kilogram, older infants relatively slightly less and children over 10 months of age a liberal soft diet.

TABLE 1.—*Comparison of the Rates of Gain of Premature Infants Not Receiving Vitamin B with Those of Premature Infants Receiving Vitamin B in the Form of Brewer's Yeast*

Points of Comparison	Without Vitamin B	With Vitamin B	Percentage Increase with Vitamin B
Number of cases	5	4	
Average gain each day, Gm.	20.93	37.64	79.8
Per cent of body weight gained each day	1.431	2.174	51.9

Owing to lack of space, only the average rates of gain of each group are given. The history numbers and rates of gain of the individual infants composing each group are on file for reference.

Four premature infants were given vitamin B in the form of brewer's yeast and the rates of gain compared with those of five premature infants admitted to the hospital at an earlier date (table 1).

Table 1 shows that there was a more rapid rate of gain in the four premature infants receiving vitamin B than in the premature infants who did not receive the accessory food factor. This increase amounts to an increase of 79.8 per cent in the average gain each day and 51.9 per cent in the percentage of body weight gained each day. This considerable increase is representative of each of the four premature infants.

The first three premature infants studied were not given vitamin B until the nineteenth, fifteenth and sixteenth days after gain in weight had started. The last premature infant in this series was given vitamin B in the form of brewer's yeast from the second day after birth, and this one far outstripped all of his predecessors in rate of daily gain.

It is interesting to compare the average rate of gain of the control series of premature infants with that of the three premature infants

before vitamin B began to be given. The control series of premature infants gained at an average rate of 20.93 Gm. each day and the three premature infants, before being given vitamin B, at the daily rate of 22.91 Gm.

Table 2 is a comparison of the rates of gain of the three premature infants before and after receiving vitamin B.

As revealed in table 2, there was a substantial increase in the rate of gain of the three premature infants amounting to 61 per cent after receiving vitamin B.

In summary, three premature infants who had been doing as well as the average premature infant in this hospital, immediately, when placed on vitamin B, gained over 79 per cent more than the average, and the premature infant given vitamin B from the second day after birth did better than any premature infant of the series.

Older Infants.—Thirty infants under 2 years of age admitted to the Vanderbilt University Hospital were given daily amounts of vitamin B

TABLE 2.—*Comparison of the Rates of Gain of Three Premature Infants Before and After Receiving Vitamin B in the Form of Brewer's Yeast*

Points of Comparison	Before Receiving Vitamin B	After Receiving Vitamin B	Percentage Increase with Vitamin B
Number of cases	3	3	
Average gain each day, Gm.	22.91	36.86	61
Per cent of body weight gained each day	1.548	2.110	35.6

in the form of brewer's yeast and their rates of gain studied. As the service at the Vanderbilt University Hospital is not large, all infants admitted during a certain length of time were given vitamin B. As controls, the rate of gain of twenty-five infants admitted immediately preceding the period of study was averaged with the rate of gain of twenty-five infants admitted during a period a year previous to this study. This was done to determine whether or not there had been any variation in the average rate of gain of infants within the year previous to the study and thus to eliminate any objection to the control rate of gain as not being representative of the average rate of gain theretofore. As far as could be determined, all groups of infants studied received comparable amounts of food; that is, the infants given vitamin B were not fed more than was customary before this study was started.

Table 3 gives a comparison of the rates of gain of infants in 1927 and 1928 not receiving vitamin B in the form of brewer's yeast. Each group of infants represents all the infants admitted to the hospital during a certain length of time. In tables 3 and 4, the column "Days in Hospital" represents the number of days the child was in the hospital from the start of gain in weight.

Table 3 shows that the average gain in weight of the infants in the two control series was practically the same. It would therefore not be far from correct to take the average of these rates of gain as the average rate of gain of infants under 2 years of age in the Vanderbilt University Hospital before this study was undertaken.

Table 4 is a comparison of the rates of gain of the fifty control infants with that of the infants receiving vitamin B daily in the form of brewer's yeast.

Analysis of the results recorded in table 4 reveals that the thirty infants who received vitamin B daily in the form of brewer's yeast gained, on an average, 106 per cent more each day than the infants who did not receive yeast, and remained in the hospital, on an average,

TABLE 3.—*Rates of Gain of Infants in 1927 and 1928 not Receiving Vitamin B in the Form of Brewer's Yeast*

Year	Number of Infants	Average Number of Days in Hospital	Gain in Weight Each Day, Gm.	Per Cent of Body Weight Gained Each Day
1927	25	25.3	27.37	0.455
1928	25	22.2	22.55	0.537
Average		23.7	24.96	0.496

TABLE 4.—*Comparison of the Rate of Gain of Infants not Receiving Vitamin B with That of Infants Receiving Vitamin B Daily in the Form of Brewer's Yeast*

Points of Comparison	Without Vitamin B	With Vitamin B	Percentage Increase with Vitamin B
Number of cases	50	30	
Average gain each day, Gm.	24.96	51.42	106
Average number of days in hospital	23.7	14.6	—38.3 (decrease)

over one-third less time than the control infants. This decrease in time subjects the infants to a greatly lessened possibility of acquiring an infection in the hospital, and in addition is a great economic benefit in a charitable or semicharitable institution.

Ten infants were studied before and after receiving vitamin B. Only one infant in this series failed to show a marked increase in rate of gain after vitamin B began to be given. This infant showed a decrease of 11 per cent in the rate of gain. The average increase in rate of daily gain of the ten infants, including the one who did not show an increase, was 167 per cent greater for the period during which vitamin B was given.

COMMENT

It is probable that the increase in the rate of daily gain represents also an increase in the rate of growth, but because of a lack of mea-

surements of the controls, it is impossible to determine whether this is true.

The mechanism by which vitamin B produces gain and growth is still debatable. Karr [11] stated, "Some relation exists in the dog between the desire to partake of food and the amount of the so-called water-soluble B vitamin ingested." Kennedy and Dutcher [14] believed that "the effect of vitamins is not necessarily an excitant to appetite, but rather a stimulation to metabolic processes which promote growth and normal functioning." Gross [15] found that in a deficiency of vitamin B there is a lowered metabolism with an accompanying low temperature. The probable mechanism is that vitamin B stimulates the metabolic processes so that there is a better utilization of food and the appetite is secondarily increased due to a greater demand for food to satisfy the increased metabolic activity. The primary value of vitamin B appears to be that of an adjuvant in the utilization of food which generally leads to an increase in appetite and well being.

Coincident with the increase in weight there was an apparent change in the dispositions of the infants, in that thin, scrawny and fretful babies became satisfied and contented. This change in disposition was observed frequently and apparently is in keeping with the observation made by Hoobler [16] that in the present American diet for infants there is a partial deficiency of vitamin B.

No harmful effects, such as distention, vomiting or diarrhea, were observed in the infants fed the amounts of brewer's yeast outlined in the first part of this study.

SUMMARY

1. The administration of brewer's yeast, for the growth-promoting factor of vitamin B that it contains, to a series of premature and other infants has produced sufficient evidence of its value to make it worth while to report the results in this small series as a means of stimulating further study along this line.

2. A series of four premature infants were fed vitamin B daily in the form of brewer's yeast, and their average daily rate of gain was over 79 per cent greater than that of other premature infants admitted to this hospital.

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14. Kennedy, C., and Dutcher, R. A.: IX. The Influence of the Diet of the Cow upon the Quantity of Vitamins A and B in the Milk, J. Biol. Chem. **50**:339 (Feb.) 1922.

15. Gross, L.: The Effects of Vitamin Deficient Diets on Rats with Special Reference to the Motor Functions of the Intestinal Tract in Vivo and in Vitro, J. Path. & Bact. **27**:27, 1924.

16. Hoobler, B. R.: Symptomatology of Vitamin B Deficiency in Infants, J. A. M. A. **91**:307 (Aug. 4) 1928.

3. A series of thirty infants were fed vitamin B daily in the form of brewer's yeast and their average daily rate of gain was over 100 per cent greater than that of other infants admitted to this hospital.

4. Brewer's yeast is apparently a substance rich in vitamin B and supplies the growth-promoting factor in large amounts. No ill effects from its use in the amounts outlined in this study were observed.

CONCLUSION

The evidence presented in this study is in apparent accord with the experimental evidence in animals—that there is a marked increase in the rate of gain and growth when a substance rich in the growth-promoting factor of vitamin B is added to the diet.

The marked increase in the rate of gain of infants given vitamin B as compared with other infants apparently indicates that there is a partial deficiency of vitamin B in the diets of many infants, and that a substance rich in the growth-promoting factor of vitamin B may be of value as a routine addition to the diet from birth.

THE COMPOSITION OF GROWTH IN INFANCY

I. A PREMATURE INFANT *

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The composition of an infant's growth, so far as mineral substances and nitrogen are concerned, can be studied by determining the retentions (intake in food minus the output in urine and stools) of these substances. By dividing the retention of a substance by the total gain in weight during the period of observation one arrives at a value for the composition of growth in respect to this substance.

A table on this subject has been compiled by Lindberg [1] from data published by other investigators. Lindberg pointed out that although definite conclusions cannot be drawn, it would seem that the composition of growth after birth was very different from the known composition of the body at birth, the growth after birth being poor in calcium and phosphorus and rich in sodium, potassium and magnesium. This conclusion of Lindberg agrees well with the results obtained in the present work. The composition of growth, to judge from Lindberg's table, shows enormous variations. One kilogram of growth contained from 56 to 700 millimols of potassium, from 50 to 399 millimols of sodium, from 39 to 310 millimols of calcium, from 30 to 135 millimols of phosphorus and from 15 to 175 millimols of magnesium. It is hardly probable that normal growth is as variable as it would seem from these figures; the marked variations are probably due to the short periods of observation (only a few days in each case). Neither the gain in weight nor the retention of mineral substances during a period of a few days would represent the average gain in weight and the average retention of that infant. It seems probable that the gain in weight on different days is of different quality, sometimes consisting chiefly of fluid, at other times to a greater extent of fat and muscle tissue. The retention of mineral substances would, of course, vary accordingly; in a period of only a few days one would not get a true picture of the composition of growth.

In order to obtain more accurate data, it is necessary to study the infant for a period of time that is long enough to be really representative

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* From the Children's Division of the Massachusetts General Hospital and the Department of Pediatrics, Harvard Medical School.

1. Lindberg, G.: Ztschr. f. Kinderh. **16**:90, 1917.

of the average growth of the infant studied. In order to determine the minimal period necessary one would have to analyze by statistical methods the growth curves of a great number of normal, breast-fed infants. As no such material is available to us, we have tried to estimate the necessary period of time in the following way: If a normal infant is weighed weekly it may occasionally happen, according to our experience, that the infant for two successive weeks shows either unusually slow or unusually rapid growth. It rarely happens that a normal breast-fed infant shows a gain much below or above his own average for three weeks in succession. It is obvious from this consideration that if an infant is studied for at least four weeks there is a fair chance that his gain in weight during this period is representative of his average gain in

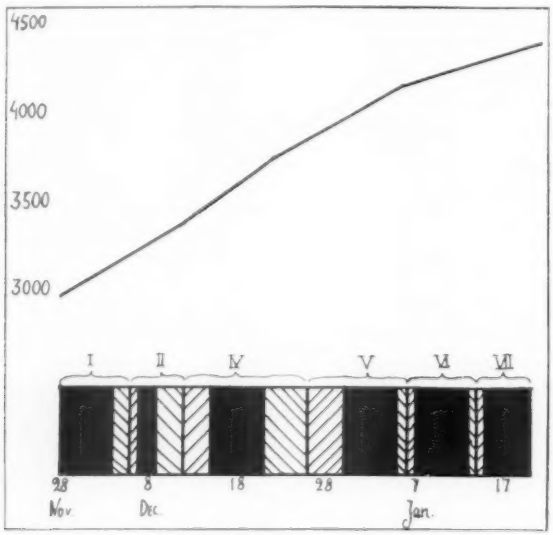

Fig. 1.—Gain in weight during experiments. The Roman numerals indicate the length of the experimental periods; the black columns, the period during which the retentions were actually determined. The vertical column of figures represents the weight in grams.

weight. It is to be supposed that the retention of mineral substances during this period also is representative of the average retention of this infant.

In our present work we have exceeded by far this minimal safe period of four weeks. An infant was studied in repeated experiments (generally of six days' duration) interspersed over a period of nearly two months. In each of these experiments the amounts of the different mineral substances retained in the body were determined. In this way, a rather accurate picture was obtained of what might be called the mineral growth of this infant.

The infant studied, who was premature and of unknown weight at birth, showed rapid gain in weight and, with the exception of the usual craniotabes of premature infants, had no abnormal symptoms. When the study was begun, the infant was 7 weeks of age. In figure 1 are shown the number and distribution of the experiments and the gain in weight of the infant during the time of observation. This included a total period of fifty-three days of which the infant spent thirty-one on the metabolism bed. The experiments were fairly evenly distributed over the total period of observation. We have, therefore, in all probability the right to consider the results obtained during the experiments as representative also of the short intervals when the infant was not on the metabolism bed. In the figure, the dark columns represent the

TABLE 1.—*Retentions of Mineral Substances and Nitrogen* *

Period	Days†	Age in Months	Nitrogen	Chlorine	Phosphorus	Calcium	Magnesium	Sodium	Potassium	Remarks
					Daily					
I	6 (8)	2	47	3.0	2.5	0.9	−0.18	6.9	3.2	
II	2 (6)	2	51	3.4	1.9	0.6	—	12.8	0.7	
IV	6 (14)	2.5	54	2.3	1.5	2.3	−0.12	2.5	1.7	
V	6 (11)	3	38	2.4	1.8	1.9	0.015	3.6	1.2	
VI	6 (8)	3	42	2.5	2.8	2.2	−0.035	3.7	1.3	
VII	5 (6)	3.5	55	2.1	1.7	1.9	0.28	—	—	
Mean			48	2.6	2.1	1.6	−0.008	5.9	1.6	
Standard deviation			6.2	0.45	0.47	0.65	0.15	3.8	0.85	
					Per Period of Examination					
I	8	.....	376	24.0	20.0	7.2	−1.44	55.2	25.6	
II	6	.....	306	20.4	11.4	3.6	(−1.08)‡	76.8	4.2	
IV	14	.....	756	32.2	21.0	32.2	−1.68	35.9	23.8	
V	11	.....	418	25.4	19.8	20.9	0.17	39.6	13.2	
VI	8	.....	336	20.0	22.4	17.6	−0.28	29.6	10.4	Gain, 1,325 Gm.
VII	6	.....	330	12.6	10.2	11.4	1.68	—	—	Gain, 1,425 Gm.
Sum			2,522	135.6	104.8	92.9	−2.63	236.2	77.2	
					Per Kilogram of Gain in Weight					
			1,769	95.2	73.5	65.2	−1.85	178.3	58.5	

* Values are expressed in millimols.
† The figures in parentheses represent the entire experimental period, in each case.
‡ Values obtained in period I have been used also in period II.

experiments; the lines between the columns show the total amount of time which the experimental periods were supposed to represent; for instance, the values obtained in the period from December 15 to 21 have been taken as representing a period from December 12 to 26. In this way a picture has been obtained of the mineral metabolism of this infant from Nov. 2, 1926, to Jan. 2, 1927, during which time the infant gained 1,425 Gm. in weight. The composition of these 1,425 Gm. might be said to be the subject of the present paper.

As to the methods used, reference may be made to a previous paper.[2] In the present paper we are concerned only with the amounts of the various mineral substances retained in the body (intake in the milk

2. Hamilton, B., and Moriarty, M.: Factors Influencing the Excretion of Calcium, Am. J. Dis. Child. **36**:450 (Sept.) 1928.

TABLE 2.—*Composition of the Body of New-Born Infants, in Millimols Per Kilogram of Body Weight*

Author	Age of Fetus	Weight	Nitrogen	Chlorine	Phosphorus	Calcium	Magnesium	Sodium	Potassium
Premature Infants									
Michel (L'Obstétrique, 1900)	6 mos.	672	1,171	..	117	153	8	..	..
Huganenq (J. de physiol. et de path. gén. **2**: 509 1900)	6 mos.	1,165	.....	57	129	163	..	90	40
	6.5 mos.	1,285	.....	62	126	156	10	90	45
Langstein-Edelstein (Ztschr. f. Kinderh. **15**: 49, 1917)	6 mos.	960	1,250	82	119	193	8	108	44
	7 mos.	1,420	1,164	65	119	168	10	94	40
Michel	7 mos.	1,024	1,114	..	111	143	8	..	..
Brubacher (Ztschr. f. Biol. **40**: 33, 1900)	7 mos.	.....	.....	..	153	188	10	..	..
Average of all premature infants			1,179±25	67±4.7	125±4.9	161±6.7	9±0.41	96±3.7	42±1.1
Infants Born at Full Term									
Camerer-Söldner (Ztschr. f. Biol. **39**: 173 1900; **40**: 529, 1900; **43**: 1, 1902)	(1) Full term	2,616	1,279	54	110	126	7	67	39
	(2) Full term	2,755	1,307	51	151	183	4	71	38
	(3) Full term	2,683	1,557	43	146	169	10	66	43
	(4) Full term	2,476	1,414	52	170	234	9	80	36
	(5) Full term	3,048	1,400	54	144	192	7	78	42
	(6) Full term	3,348	1,500	52	140	188	6	77	42
Michel	Full term	3,335	1,557	56	179	251	10	..	..
Huganenq	Full term	2,720	.....	44	175	259	14	92	46
	Full term	3,300	.....	42	163	235	..	57	51
Average of all full term infants			1,436±40	50±1.6	153±6.8	204±14	8±1.0	75±3.6	42±1.6
Difference between full term and premature infants			257±17	17±5	28±8.4	43±15	1±1.1	21±5.2	0±1.9
Difference divided by standard error of difference *			5.5	3.4	3.3	2.9	0.9	4.0	0

* As the number of observations is small, the standard error has been used instead of the probable error. The difference has been taken as significant when it is at least three times as large as its standard error.

minus excretion in the stools and urine); these retentions, both in absolute values and calculated as retention per kilogram of gain in weight, are shown in table 1.

Of great interest is a comparison between these figures and the composition of the body at birth. It may be seen in table 2 that the available data as to the composition of the body at birth are fairly numerous, although little has been added recently to our knowledge in this field. The difference between the body of the premature infant and that of an infant born at full term seems to be as follows: The concentration

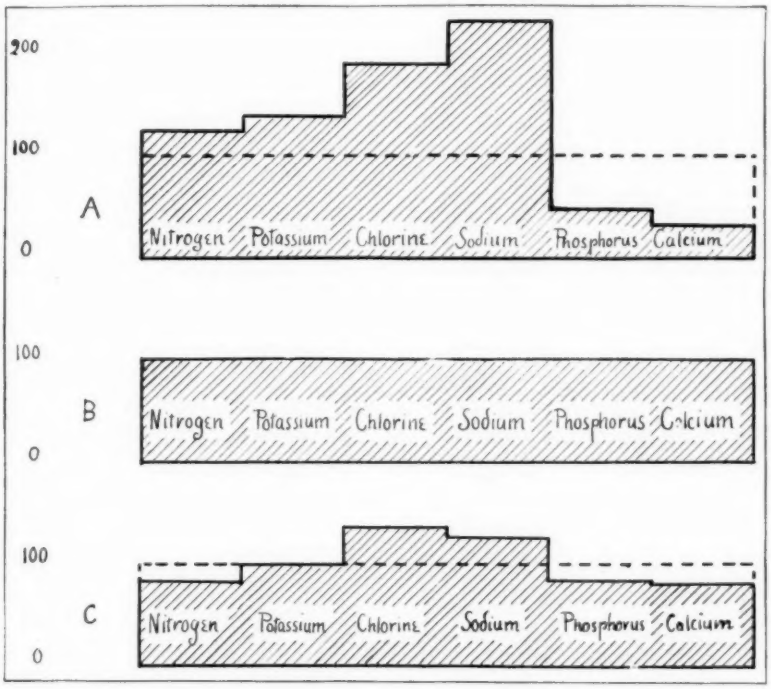

Fig. 2.—*A*, the composition in millimols per kilogram of growth in experimental subject, the composition of new-born, full-term infants being taken as 100; *B*, the composition of new-born infants born at full term, and *C*, the composition in millimols per kilogram of weight of new-born premature infants, the composition of new-born, full-term infants being taken as 100.

(the amount per kilogram of body weight) of nitrogen is lower in the body of the premature infant; the concentration of phosphorus is lower, possibly also that of calcium, while the concentration of sodium and of chlorine is higher in the premature infant. From these differences one may make a surmise as to the quality of the growth during the last one or two months of fetal life. The decreased concentration of sodium and of chlorine may possibly be an expression of the decrease in the

water content of the body, which takes place all during fetal life.[3] The increased nitrogen content of the body will be discussed later. The increase in calcium and phosphorus (the figures suggest that such an increase takes place, but do not allow any definite conclusions as to calcium) would indicate the formation of calcified osseous tissue.

If the retentions per kilogram of growth in the case studied by us are compared with these figures for composition of the body at birth, it becomes evident that the composition of this infant's body must have changed during the time of observation (fig. 2).

RETENTION OF MINERAL SUBSTANCES

Calcium.—The daily retentions of calcium were of the same magnitude as those found in normal infants (normal retentions, table 3). The amount of calcium, however, in 1 Kg. of growth was considerably less than the calcium concentration of the body at birth, both of premature infants and of those born at full term. The calcium concentration of the body of this infant must have decreased considerably after birth. As pointed out in a previous paper,[4] a decrease of the calcium concentration of the body is probably a normal phenomenon, and may be interpreted as the consumption of a congenital store of calcium which must be located in the bones. It has been pointed out to us by Dr. E. A. Park that in the roentgenogram the bones of new-born infants show a narrow marrow cavity and a thick cortex in comparison with those of older infants. This observation confirms the view that normal infants are born with a surplus of calcium which is consumed during early infancy.

In the absence of accurate normal data it is impossible to say whether the calcium concentration in the gain in weight of this infant was lower than normal. The infant developed the usual craniotabes of premature infants. We are inclined to consider this craniotabes as the clinical expression of a normal or more than normal decrease in the calcium concentration of a body which at birth was poor in calcium.

Phosphorus.—The daily retentions of phosphorus were found to be within about the same range as in normal infants. It is obvious, however, that the amount of phosphorus retained was insufficient to maintain the phosphorus concentration of the body at the level found at birth. The retention of phosphorus per kilogram of gain in weight was much lower than the phosphorus concentration in the body of the new-born infant. There must have been a drop in the phosphorus concentration of the body after birth, in all probability connected with the decrease of the calcium concentration.

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3. Fehling: Arch. f. Gynak. **11**:523, 1877.
4. Hamilton, B.: Acta paediat. **2**:1, 1922.

Sodium and Chlorine.—Both sodium and chlorine were retained in amounts larger than those found in the normal infants reported in table 3. If we compare the retentions per kilogram of gain in weight with the concentration of sodium and chlorine in the body at birth, it may be seen that the concentration of these two substances must have increased in the body. Such an increase might be due either to an increased concentration of these substances in the plasma and the tissue fluids, or to an increase of the total amount of plasma and tissue fluids. The last mentioned possibility seems to us the more probable.

TABLE 3.—*Retentions of Normal, Breast-Fed Infants, Aged from 2 to 3.5 Months* *

Author	Age	Weight	Nitrogen	Chlorine	Phosphorus	Calcium	Magnesium	Sodium	Potassium
Peiser (case Gl.) (Jahrb. f. Kinderh. **81**: 437, 1915)	2.0	3,720	31	...	...	0.9	....	...	...
Tobler-Noll (Monatschr. f. Kinderh. **9**: 210, 1911)	2.5	4,085	39	0.9	1.7	1.0	....	3.3	1.9
Lindberg (Ztschr. f. Kinderh. **16**: 90, 1917)	2.5	4,330	35	2.5	2.3	1.1	0.40	1.3	1.0
Muhl (case B-1) (a)	2.5	5,490	45	0.9	1.7	1.6	0.40	0.7	0.8
(Acta paediat., vol. 2, supplement, 1924) (b)	2.5	5,560	36	1.7	1.6	1.7	0.37	1.0	0.8
Michel-Perret (Bull. Soc. d'obst. et de gynéc. de Paris, 1899)	3.0	4,725	56	1.2	1.7	2.7	....	...	...
Malmberg (case S. E.). (a)	3.5	5,445	38	1.4	3.0	2.6	0.50	1.5	1.6
(case O. G.). (b)	3.5	5,440	40	1.8	3.3	2.8	0.35	1.3	1.7
(Acta paediat. **2**: 209, 1924)									
Mean			40	1.5	2.2	1.8	0.40	1.5	1.3
Standard deviation			7.1	0.4	0.7	0.8	0.05	0.7	0.5

* Values are expressed in millimols daily.

Potassium and Nitrogen.—The daily retentions of these two substances were of normal magnitude. According to table 2, the nitrogen concentration of the new-born premature infant is lower than that of the infant born at full term. This increase of the nitrogen concentration of the body seems, in the case here reported, to have continued after birth. The amount of nitrogen retained per kilogram of growth is considerably higher than the amount found per kilogram of body weight at birth. The difference between nitrogen concentration in a premature and a full-term infant is not accompanied by a parallel difference in the potassium concentration. Blood plasma is rich in nitrogen and poor in potassium; an increase in the amount of plasma per kilogram of body weight would, therefore, have the effect of increasing the concentration of nitrogen but not of potassium. The increase in nitrogen is, however, too marked to be explained by changes of the blood plasma alone. There

must have been changes taking place also in the composition of the body cells. The body cells are rich in both nitrogen and potassium; a parallel increase in the concentration of both these substances, such as is found in the growth after birth, is therefore probably indicative of an increase in the mass of soft protein-containing tissues in relation to the total weight of the body.

Magnesium.—The infant had negative balances of magnesium in three of five periods. As far as we know, the magnesium metabolism of premature infants has not been studied; in normal infants negative balances have not been found. As the magnesium content of the milk given to the infant was rather low, we refrain from drawing any conclusions from this observation.

COMMENT

It has previously been pointed out by one of us that there must be a change in the composition of the skeleton after birth. The present work confirms this view and makes it necessary to assume that changes also take place in the soft tissues. It shows, we think, that the chemical composition of the body is subject to rather rapid changes during early infancy. It is conceivable that the exaggeration of these changes or the failure of these changes to take place may play an important part in the pathogenesis of diseases in infancy. It is possible that the vague differences between the breast-fed and the artifically fed infant could be more accurately defined if the quality of their growth were studied for sufficiently long periods. Some of these problems are probably accessible by animal experimentation.

SUMMARY

A premature infant was studied in frequently repeated experiments for a period of fifty-three days. The retentions of nitrogen, chlorine, phosphorus, calcium, magnesium, sodium and potassium were determined. The infant gained 1,425 Gm. during the period of study.

The retentions per kilogram of gain in weight are compared to the published data on the composition of the body at birth. The gain in weight was found to be poor in calcium and phosphorus, and rich in sodium, potassium, chlorine and nitrogen, compared to the amounts of these substances in the body of the new-born infant, whether born prematurely or at full term.

Perhaps the most probable interpretation of the results is that during the time of observation there was a progressive loss of lime salts from the bones, an increase in body fluids and a change in either the composition or the relative mass of the cellular tissues.

THE RELATION OF RATE OF GROWTH IN INFANTS TO DIET *

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It is well known by students of animal nutrition that among the lower animals the physical measurements of individuals of a given species can be considerably altered by changes in the amount and kind of the various components of the diet. Whether the norms of growth of the human body can be modified by such means is not known definitely. It seems probable, however, that as more is learned concerning the quantitative biologic needs of the human organism, and this knowledge is incorporated into daily living, the present standards of height and weight may become considerably changed, particularly in regard to children. Undoubtedly, there is a "fairly definite upper limit of body size that is fixed by heredity," [1] but that the present accepted averages are at all indicative of this upper limit is questionable. The physical measurements of the group of intellectually gifted children in California, reported by Baldwin,[2] are in all probability more nearly the standard which should be attained by all children.

The difference between the amounts of calcium and phosphorus retained by infants who were receiving feedings of modified cow's milk and the amounts retained by infants who were receiving similar feedings to which cod liver oil had been added, led us to consider the rate of growth of these two groups as indicated by gain in weight, retention of nitrogen and elimination of creatinine.

The data of the investigation are compiled from a series of metabolic studies of infants, some of which have been reported in detail in

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* From the Department of Nutrition, Child Welfare Research Station, State University of Iowa.

* This study was made possible through the courtesy of the Department of Pediatrics, College of Medicine of the State University of Iowa.

1. Osborne, T. B., and Mendel, L. B.: J. Biol. Chem. **69**:661, 1926.

2. Baldwin, B. T.: Anthropometric Measurements of a Group of Gifted Children. Genetic Studies of Genius, Palo Alto, Calif., Stanford University Press, 1925, vol. 1.

previous communications [3] and others of which will be reported in the near future. These data have been grouped in relation to the elimination of creatinine by the various infants, since it seems probable that the amount of creatinine excreted is more nearly a measure of the infant's physical development than either weight or chronologic age. The birth weights recorded in the various groups are averages of those of all the infants whose output of creatinine fell within the given range at the time the metabolic studies were made. Similarly, the actual and the theoretical weights [4] are the averages of those of all the infants having the same range in the elimination of creatinine at the time of the studies. The average amounts of calcium, phosphorus and nitrogen retained by the infants in each group at the various levels of output of creatinine also are reported.

TABLE 1.—*Relation of Growth to Calcium, Phosphorus and Nitrogen Retention and Creatinine Elimination in Infants Receiving Feedings of Modified Cows's Milk*

Range of Urinary Creatinine, Mg.	Studies of Metabolism	Average Age Infants Mo.	Da.	Average Birth Weight, Gm.	Average Weight Actual, Gm.	Theoretical, Gm.	Average Amount of Urinary Creatinine, Mg.	Nitrogen Ingested, Gm.	Average Amount of Nitrogen Retained Per Kg. Actual Weight, Gm.	Per Kg. Theoretical Weight, Gm.	Per Mg. Urinary Creatinine, Mg.	Average Amount of Calcium Retained per Kg., Gm.	Phosphorus Retained per Kg., Gm.
40-50	3	2	14	3,306	4,008	4,306	41	2.25	.....	.....	....	....	.....
50-60	3	3	23	3,418	4,710	5,398	57	2.87	0.144	0.125	11	0.0026	0.009
60-70	8	5	5	3,953	5,673	6,752	66	3.47	0.064*	0.053	5.2	0.032*	0.012*
70-80	17	7	1	3,516	6,962	7,016	76	4.05	0.104	0.10	8	0.011	0.008†
80-90	10	7	4	3,633	7,225	7,216	85	3.87	0.089	0.088	7.1	0.015	0.0068†

* Six studies of metabolism were made between May 2 and June 2. Two infants received butter oil; one, butter fat.

† One infant received butter oil during the metabolic period.

It should be understood that the same group of infants was not carried throughout the entire series of studies. At certain levels of output of creatinine there were many more infants than at others. In some cases, only two metabolic studies were made on the same infant; in others, five or six were made.

Table 1 includes the results of studies of infants receiving feedings of cow's milk modified by the addition of either dextrimaltose or lactose, and distilled water. During a few of the periods of study of metabolism, butter oil or butter fat was substituted for an equivalent amount of milk fat in the feedings. These substitutions are indicated.

3. Daniels, A. L., and Stearns, G.: J. Biol. Chem. **61**:225, 1924. Daniels, A. L., and Hutton, M. K.: Proc. Soc. Exper. Biol. & Med. **25**:794, 1928. Daniels, A. L.; Stearns, G., and Hutton, M. K.: Calcium and Phosphorus Metabolism in Artificially Fed Infants, Am. J. Dis. Child. **37**:296 (Feb.) 1929.

4. The theoretical weights have been determined according to the formulas of Finkelstein. For infants through the sixth month: Birth weight + (age in months × 600) — 300. For infants from seventh month to one year: Birth weight + (age in months × 500).

Table 2, group A, considers the average weights attained, the average amounts of creatinine eliminated and the average amounts of nitrogen ingested by all infants receiving feedings of modified cow's milk to which cod liver oil had been added fairly consecutively from the time that the infants were 18 days of age. During certain of the periods study of metabolism, either some of these infants were receiving other forms of cow's milk modifications, for example, desiccated milk or irradiated milk, or the stools were not of uniform con-

TABLE 2.—GROUP A.—*The Relation of Growth to Creatinine Elimination in Infants Receiving Feedings of Cow's Milk with Cod Liver Oil*

Range of Urinary Creatinine, Mg.	Studies of Metabolism	Average Age of Infants		Average Birth Weight, Gm.	Average Weight		Average Amount of Nitrogen Ingested, Gm.	Average Amount of Urinary Creatinine, Mg.
		Mo.	Da.		Actual, Gm.	Theoretical, Gm.		
50- 60	11	3	7	3,036	5,117	4,653	3.21	55
60- 70	24	3	25	3,132	5,897	5,152	3.22	65
70- 80	39	4	16	3,405	6,580	5,805	3.48	74
80- 90	12	4	24	3,336	7,173	5,916	3.62	83
90-100	6	5	18	3,695	7,934	6,755	4.06	94
100-110	6	6	7	3,988	9,363	7,408	4.86	113

TABLE 2.—GROUP B.—*Relation of Growth to Calcium, Phosphorus and Nitrogen Retention and Creatinine Elimination in Infants Receiving Feedings of Cow's Milk with Cod Liver Oil*

Range of Urinary Creatinine, Mg.	Studies of Metabolism	Average Age Infants		Average Birth Weight, Gm.	Average Weight		Average Amount of		Average Amount of Nitrogen Retained			Average Amount of	
		Mo.	Da.		Actual, Gm.	Theoretical, Gm.	Urinary Creatinine, Mg.	Nitrogen Ingested, Gm.	Per Kg. Actual Weight, Gm.	Per Kg. Theoretical Weight, Gm.	Per Mg. Urinary Creatinine, Mg.	Calcium Retained per Kg., Gm.	Phosphorus Retained per Kg., Gm.
50-60	7	3	5	3,004	5,001	4,604	56	3.31	0.124	0.135	11.2	0.026	0.019
60-70	18	4	2	3,060	5,902	5,200	65	3.36	0.123	0.139	11.2	0.039	0.027
70-80	20	4	13	3,245	6,439	5,645	75	3.47	0.11	0.127	10.0	0.039	0.025
80-90	9	5	4	3,394	7,274	6,244	83	3.78	0.10	0.11	8.9	0.034	0.021
90-100	4	5	21	3,556	8,089	6,256	93	4.09	0.089	0.11	8.1	0.033	0.017

sistency, and therefore the amounts of nitrogen retained at this particular time were not a measure of the amounts usually retained. Table 2, group B, therefore includes, besides the average weights and the average amounts of creatinine eliminated, only the average amounts of calcium, phosphorus and nitrogen retained by the normal infants who were receiving feedings of modified cow's milk to which cod liver oil had been added.

The feedings in both groups were either pasteurized or quickly boiled, a much larger proportion of pasteurized feedings being used among the infants who were not receiving cod liver oil.

An extract of wheat embryo containing vitamin B was often added to the feedings of the infants in both groups. In the studies of

metabolism reported, this was not incorporated in the feedings while the infants were under observation. A concentrated vegetable extract also was used as a part of the diluent after the infants were 4 months of age. In every case, this was omitted at least three days before the metabolic study was made. Although the infants receiving cod liver oil were given the extract containing vitamin B somewhat more assiduously than the infants who did not receive cod liver oil, we feel that this was not the potent factor in influencing the results.

In constructing the formulas of the feedings, in all cases, an amount of milk was prescribed equal to 10 or 11 per cent of the theoretical weight (in ounces) of the infant. To this was added enough carbohydrate to bring the caloric value of the food up to the required amount. If the infant was heavier than his estimated theoretical weight, his formula was constructed on the basis of his actual weight. The infants in the group given cod liver oil gained in weight more rapidly than those in the group not given cod liver oil. Therefore, the amount of milk at a given age level was somewhat more than in the group receiving no cod liver oil. This is indicated in the tables by the averages for the ingestion of nitrogen.

The conspicuous difference in the rate of growth between these two groups of infants is shown by the weight curves in charts 1 and 2. The infants receiving the cod liver oil were much heavier at the same age than those receiving no cod liver oil. They also weighed more than their theoretical weights, or the accepted norms of weight of infants of their respective ages and birth weights.[5] For example, at 6 months, and 7 days of age, six infants in the group given cod liver oil (table 2, group A) averaged 4.3 pounds more than the theoretical weights of infants of their respective ages and birth weights. Twelve infants in this group with an average birth weight of 3,336 Gm. weighed at 4 months, 24 days, more than ten infants at 7 months, 1 day, with a slightly higher average birth weight in the group receiving no cod liver oil (table 1).

A comparison of the curves (charts 1 and 2) representing the eliminations of creatinine of the two groups of infants indicates that the greater increments in weight in the group given cod liver oil are coexistent with an increase in urinary creatinine. Twelve infants at 4 months, 24 days excreted an average of 83 mg. of creatinine, the same approximate amount (85 mg.) as ten infants in the group receiving no cod liver oil excreted at 7 months, 4 days. The average birth weights of the two groups (3,336 Gm. and 3,633 Gm., respectively) were fairly comparable, that of the older group being slightly heavier.

5. Norms of Height and Weight for Preschool Children, Iowa Child Welfare Research Station and Federal Children's Bureau, Iowa City, 1926.

In the group receiving no cod liver oil, eight infants with an average birth weight of 3,953 Gm. excreted an average of 66 mg. of creatinine at 5 months, 5 days, whereas six infants of approximately the same age, with a somewhat lower average birth weight, in the group receiving cod liver oil, excreted an average of 94 mg. of creatinine. If, as is generally believed, the amount of creatinine excreted is a measure of the muscle mass, it would seem that the infants receiving cod liver oil were not only the heavier at the same age but were muscularly the better developed.

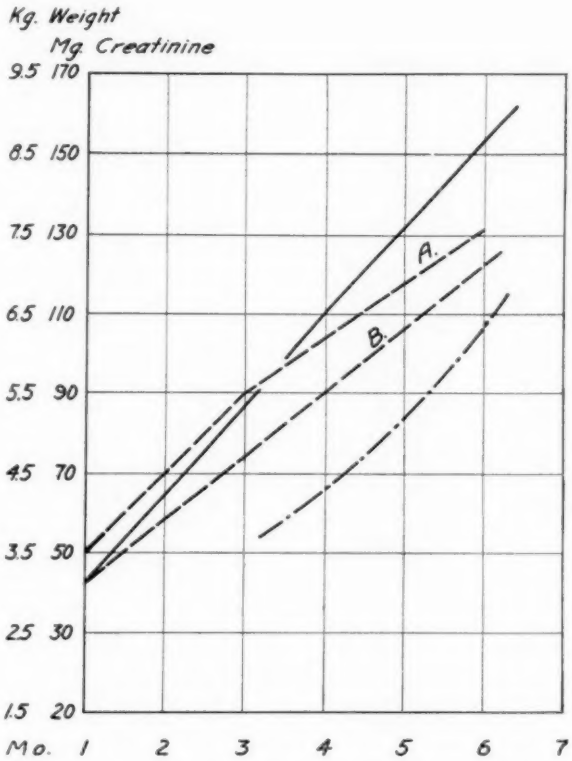

Chart 1.—Curves of growth of infants receiving feedings of modified cow's milk with cod liver oil. The solid line represents the average gains in weight during a six months' period. The broken lines represent the average theoretical weights, and the dot dash line the amounts of urinary creatinine.

In the study an attempt was made to determine whether the amount of nitrogen retained more nearly parallels weight or more nearly parallels the elimination of creatinine. If creatinine is an end-product of muscle metabolism, it seems probable that a closer correlation should exist between creatinine and retention of nitrogen than between weight and retention of nitrogen. We therefore investigated the retention of

nitrogen in the various groups in relation (1) to the actual weights; (2) to the theoretical weights, and (3) to the elimination of creatinine.

With the infants receiving the cod liver oil (table 2, group B) there was a slight but very gradual decrease in the amount of nitrogen retained per kilogram of body weight, estimated on the actual weight. Less consistency obtained when the retention of nitrogen was estimated on the theoretical weights. In the group which did not receive

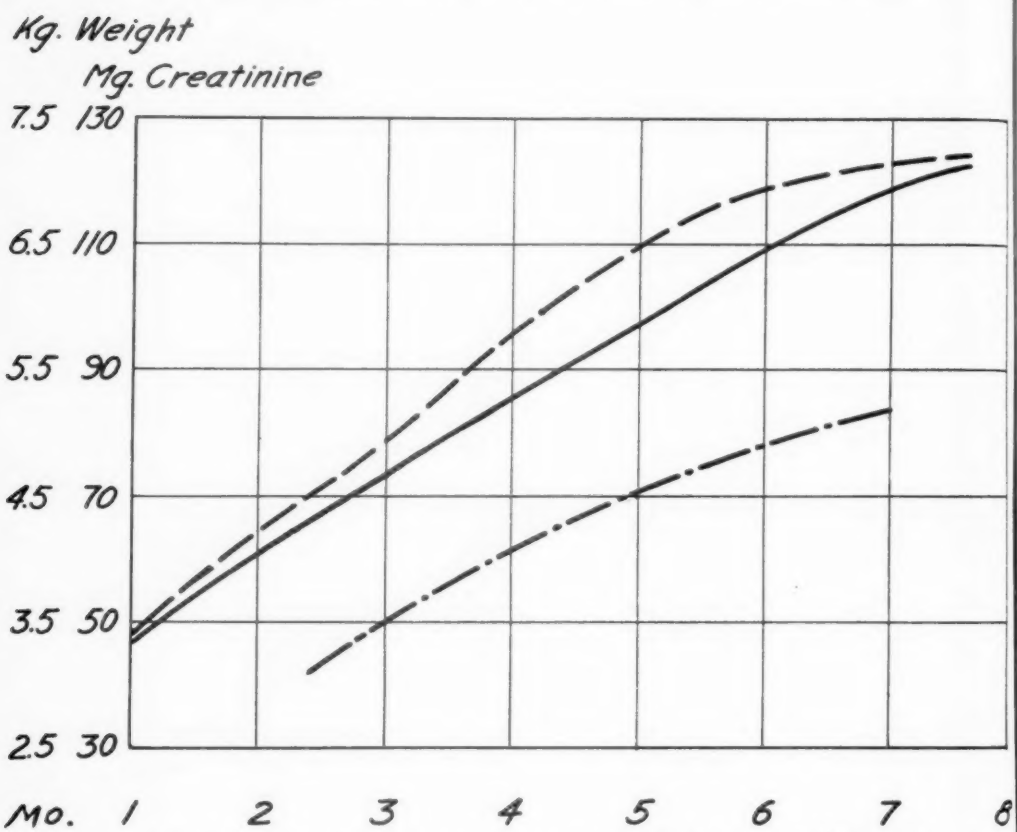

Chart 2.—Curves of growth of infants receiving feedings of modified cow's milk. The solid line represents the average weights of the infants during a seven months' period. The broken lines indicate the average theoretical weights, and the dot dash line the amounts of urinary creatinine.

cod liver oil (table 1) there was no constant relation between the amount of nitrogen retained and weight. In these, the youngest group retained the highest amount per kilogram, while the next youngest retained the least amount.

The amounts of nitrogen retained considered in relation to the amounts of creatinine eliminated showed some consistency in both

groups, more among the infants receiving the cod liver oil. In this group, the greatest retention (11 mg.) per milligram of creatinine was obtained in the infants with the least excretions of creatinine, while the least retention per milligram of urinary creatinine (average 8.1 mg.) was coexistent with the greatest excretion of creatinine. Between these two groups there was a very slight but gradual decrease in the amount of nitrogen retained per milligram of creatinine excreted.

In the groups receiving no cod liver oil, the greatest retention also was found among the younger infants, with the lowest outputs of creatinine. The amounts of nitrogen retained in this group were comparable with those of the group receiving cod liver oil. There was less consistency in the other groups. At the excretory level of 76 mg. of creatinine, 8 mg. of nitrogen per milligram of creatinine were retained in the group receiving no cod liver oil, while 10 mg. were retained at the 75 creatinine level by the group receiving cod liver oil. Similarly at the 85 mg. creatinine level, less nitrogen was retained by the group which did not receive cod liver oil. Whether these observations are within the limits of experimental error, and whether they are of significance in evaluating the physiologic functioning of the organism, we cannot say. The fact that generally lower amounts of nitrogen are retained in the group receiving no cod liver oil suggests that the lower values are related to a less perfect muscular development.

That there may be a definite relation between nitrogen and calcium metabolism is indicated by a comparison of the amounts of calcium and of nitrogen retained in the two groups. With one exception, the amounts of calcium retained in the groups receiving cod liver oil are conspicuously higher than those in the groups that did not receive cod liver oil. The amounts of nitrogen retained in the former group are also higher at the same level of creatinine. There are, furthermore, greater variations among both the amounts of calcium and the amounts of nitrogen retained in the group that received no cod liver oil. In a previous communication,[3] it was shown that infants receiving feedings of cow's milk with cod liver oil often retained less than the theoretical optimal amount of calcium. The variation in the relationships of the retentions of calcium and nitrogen may be due to the fact that these less than optimal retentions of calcium do not affect the retentions of nitrogen at the same time. One may precede the other. Our studies of metabolism were not such as to show this.

The amounts of phosphorus retained by the group receiving the cod liver oil were consistently higher than by the group that received no oil, and they paralleled the amounts of calcium retained. There is a less constant relationship among the groups that did not receive the oil. The relationships of the calcium, phosphorus and nitrogen retentions of these two groups are illustrated in charts 3 and 4. Physiologically, these two groups of infants seem to be quite unlike.

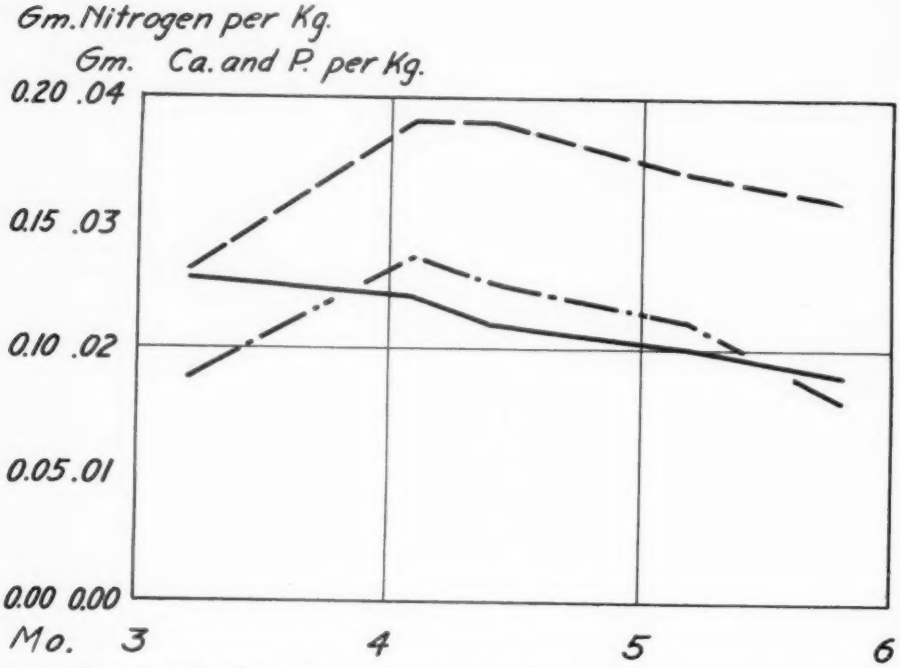

Chart 3.—The relation of the nitrogen (solid line), calcium (broken line) and phosphorus (dot dash line) retentions of infants receiving feedings of cow's milk with cod liver oil.

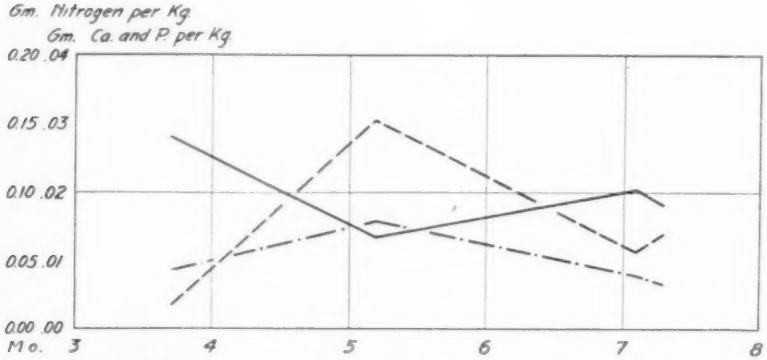

Chart 4.—The relation of the nitrogen (solid line), calcium (broken line) and phosphorus (dot dash line) retentions of infants receiving feedings of cow's milk.

The better physical development of the infants receiving the feedings with the additions of cod liver oil we attribute largely to the increased antirachitic potency of the feeding mixture. The feedings that included cod liver oil, however, were much richer in vitamin A and possibly in vitamin B. To what extent, these augmented the beneficial effects of the antirachitic vitamin is not shown. Animals that have received rations low in the antirachitic vitamin, fortified with cod liver oil, or irradiated with the mercury quartz lamp, are larger and retain more calcium and phosphorus than other animals receiving similar rations without the oil or irradiation. The rations tested contained an abundance of all the essential constituents, with the exception of antirachitic vitamin and calcium, whereas milk may be low in several essential constituents.

Recently Brahm and Mende [6] observed that the addition of irradiated olive oil to the feedings of two infants with rickets improved the nitrogen balance as well as that of the calcium and phosphorus. These results are in accord with our observations.

The fact that the infants receiving feedings of cow's milk with cod liver oil were heavier at a given age (1) than those who did not receive cod liver oil, and (2) than their theoretical weights or the accepted standards of weights for infants of their age, together with the fact that the elimination of creatinine and retention of nitrogen at a given age were greater, suggests that the accepted standards of growth for infants are too low. It seems probable that conditions which make for better utilization of calcium and phosphorus will result in larger and physically better developed children.

SUMMARY

Two groups of infants receiving feedings of modified cow's milk, one with cod liver oil and one without, have been studied from the standpoint of growth as exemplified by gains in weight and in the amounts of nitrogen, calcium and phosphorus retained and of creatinine eliminated.

The infants receiving the cod liver oil in addition to milk not only weighed more at the same age than did those who were not receiving the cod liver oil, but were considerably heavier than the accepted standards for infants of their respective ages and birth weights. This increase in weight was accompanied by an increase in the amount of the urinary creatinine, suggesting that these heavier children had a better development of muscle.

The relation between retention of nitrogen and elimination of creatinine was found to be more nearly constant than that between body

6. Braham, C., and Mende, I.: Arch. f. Kinderh. **79**:138, 1926.

weight and elimination of creatinine. As the infants increased in age, up to 6 months at least, the amount of nitrogen retained per milligram of urinary creatinine gradually decreased.

In the infants receiving cod liver oil there was a parallelism between the amounts of calcium, phosphorus and nitrogen retained. This was not found to be the case in the infants who did not receive cod liver oil.

The better physical development of the infants receiving cod liver oil is attributed largely to the increased antirachitic potency of the feedings. Vitamin A and vitamin B, however, may have been contributing factors.

The investigation indicates that the accepted standards of growth for infants are too low.

THE EFFECT OF ULTRAVIOLET LIGHT ON THE BLOOD OF NEW-BORN INFANTS

III. THE WHITE CELLS *

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With the increasing use of the ultraviolet light as an important therapeutic measure for children, it is obviously necessary to ascertain the effect of this procedure on the young organism. In the first paper of this series, it was shown that the ultraviolet light was capable of increasing the blood platelets in the new-born infant.[1] The second paper dealt with the erythrocytes and hemoglobin.[2]

MATERIAL

This study is based on the observations on a series of 120 new-born infants during a period of ten months. The total white cell count and the differential count were made within six hours after birth, and at twenty-four hour intervals thereafter. The determinations were made at the same time every day.

Treatments with the ultraviolet rays were begun on alternate infants on the second day, and continued thereafter at the same time on each of the following four days.

METHOD

The total white cell count was made in the usual manner with a Turk counting chamber. For the differential count two slides were made in each case. The first was stained by the usual method of Wright and was used chiefly as a check on the various white cell elements. The second slide was used for studying the various classes of polymorphonuclears. These slides were stained with carbol-pyronin.[3] The films were dried in air and the stain applied for fifteen minutes. No preliminary fixation is required after washing and drying. They are examined unmounted. The stain imparts a deep blue color to the nuclei and a pink color to the cytoplasm. The red cells stain feebly pink.

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* Submitted for publication, Jan. 15, 1929.

* From the Department of Pediatrics, Rush Medical College of the University of Chicago, and the Presbyterian Hospital.

1. Sanford, H. N.: The Effect of Ultraviolet Light on the Blood of New-Born Infants: I. Blood Platelets, Coagulation and Bleeding Time, Am. J. Dis. Child. **33**:50 (Jan.) 1927.

2. Sanford, H. N.: The Effect of Ultraviolet Light on the Blood of New-Born Infants: II. Erythrocytes and Hemoglobin, Am. J. Dis. Child. **35**:9 (Jan.) 1928.

3. Cooke, W. E., and Ponder, Eric: The Polynuclear Count, Philadelphia, J. B. Lippincott Company, 1927.

In drawing the blood to make determinations, the skin of the heel was thoroughly cleansed with green soap and water, and finally with alcohol. A deep puncture was then made into the heel, which resulted in an adequate flow of blood. To insure a free flow, three drops were allowed to fall as a routine.

TABLE 1.—*Total White Cell Count in Series of New-Born Infants*

	Normal			Ultraviolet Exposure		
Day	Maximum	Minimum	Average	Average	Minimum	Maximum
1	22,000	10,800	14,800	14,000	10,500	21,800
2	21,000	10,000	13,800	13,500	10,000	20,500
3	16,500	8,800	11,800	14,800	9,500	20,800
4	14,200	7,000	10,200	14,000	8,500	18,500
5	14,000	6,800	10,500	13,800	7,500	17,500
6	12,800	6,500	10,200	14,200	8,000	18,000
7	13,000	7,000	11,000	12,000	8,000	16,500
8	12,500	7,200	10,500	11,500	8,000	14,800
9	11,800	8,000	10,200	11,000	8,000	14,000
10	12,000	8,000	10,200	10,500	8,000	14,200

TABLE 2.—*Differential Count—Normal*

	Leukocytes						
Day	I	II	III	IV	Lympho-cytes	Myelo-cytes	Eosino-phils
1	40	28	2	..	19	10	1
2	36	22	1	..	28	12	1
3	30	24	2	..	30	12	2
4	26	22	4	..	32	15	1
5	28	18	4	..	33	15	2
6	20	19	5	..	38	16	2
7	20	13	7	..	41	16	3
8	18	14	6	..	44	15	3
9	15	10	9	1	45	16	4
10	12	13	8	3	46	16	2

TABLE 3.—*Differential Count—Ultraviolet*

	Leukocytes						
Day	I	II	III	IV	Lympho-cytes	Myelo-cytes	Eosino-phils
1	38	25	3	..	22	11	1
2	37	21	2	..	26	12	2
3	26	12	13	2	36	11	..
4	38	11	2	..	38	11	..
5	34	12	2	..	44	8	..
6	20	8	..	..	62	10	..
7	14	4	..	..	70	12	..
8	26	12	..	..	50	12	..
9	23	16	5	..	49	7	..
10	18	12	6	..	50	14	..

Treatments with the ultraviolet ray were given by means of an air cooled mercury vapor quartz lamp, of 110 volts, 60 cycles and 10 amperes. A voltage of 70 was always administered and maintained throughout the exposures. The technic of the exposures has been described in an earlier paper; the dorsal and ventral surfaces were first exposed for one minute each, and the time was increased one minute a day until the fourth day. The results are shown in tables 1, 2 and 3.

COMMENT

In the normal series, the number of white cells compares favorably with that found by other investigators.[4] The variations between the count in sexes were within the limits of technical error and not worth recording.

In the series of infants receiving treatment with the ultraviolet ray, there was a slight increase in the total number of white cells within twenty-four hours after the first treatment. This increase was in the mononuclears and lymphocytes, with a decrease in the total polymorphonuclear leukocytes. This result agrees with that of the majority of investigators.[5] It must be understood that the increase was the result of a general average. In some cases there was an actual decrease in the total white cell count, and many infants showed no change from normal. In general the most marked increases were in infants whose total white cell count was high, or in those who showed an early tendency to an increase in lymphocytes under normal conditions.

In the normal infant the character of the white cells begins to change on the second day, the so-called "birth leukocytosis" being replaced by the small lymphocytes. It is on such a system that the ultraviolet light appears to exert a double effect: first an increase in small lymphocytes and second a change in the types of leukocytes. Laurens and Sooy[6] and later Gunn[7] were of the opinion that there was no constant change in the white cells following irradiation. Clark[8] attempted to explain these varying results by the hypothesis that wave lengths shorter than

4. Lucas, W. B.; Dearing, B. F.; Hobler, H. R.; Cox, A.; Jones, M. R., and Smyth, F. S.: Blood Studies in the New-Born, Am. J. Dis. Child. **22**:525 (Dec.) 1921. Lippman, H. S.: A Morphologic and Quantitative Study of the Blood Corpuscles of the New-Born, Am. J. Dis. Child. **27**:473 (May) 1924.

5. Bernhard, O.: Sonnenlichtbehandlung in der chirurgischen Tuberkulose, Strahlentherapie **8**:500, 1918. Taylor, H. D.: Effect of Exposure to Sun on Circulating Lymphocytes, J. Exper. Med. **29**:41 (Jan.) 1919. Bauman, M.: Ueber Veränderungen der weisen Blutsellen, Ztschr. f. exper. Path. u. Therap. **21**:409, 1920. Aschenheim, E., and Meyer, S.: Der Einfluss des Lichts auf das Blut, Ztschr. f. exper. Path. u. Therap. **22**:22, 1921. Burchardi, K.: Blutbefunde bei Kohlenbogenlicht Bestrahlung, Strahlentherapie **12**:808, 1921. Balderrey, F. C., and Ewald, E.: Light Energy in Therapeutics, Am. Rev. Tuberc. **8**:501 (Feb.) 1924. LaGrasso, H., and Balderrey, F. C.: Heliotherapy in the Treatment of Pulmonary Tuberculosis, Am. Rev. Tuberc. **10**:117 (Oct.) 1924.

6. Laurens, H., and Sooy, J. W.: Effect of Light and Darkness on the Blood, Proc. Soc. Exper. Biol. & Med. **22**:114, 1924.

7. Gunn, F.: Influence of Ultraviolet Light upon Blood Picture, Proc. Soc. Exper. Biol. & Med. **24**:123 (Nov.) 1926.

8. Clark, J. H.: Action of Light on Leukocyte Count, Am. J. Hyg. **1**:39 (Jan.) 1921.

from 300 to 330 millimicrons produced a lymphocytosis but had no influence on the polymorphonuclears; those between 330 and 390 millimicrons decreased the lymphocytes and had no effect on the polymorphonuclears; those from 450 to 650 millimicrons stimulated both, while those longer than 650 millimicrons had no effect.

Miles and Laurens,[9] using a carbon arc, found that light generally had the effect of increasing the lymphocytes and lymphoblastic cells. While different wave lengths of light may exert a specific influence on certain classes of cells, it would appear that certain stimulating influences within the hemopoietic system are more likely set at work by a general property of exposure to light. The system that is under the greatest tension would, therefore, be more greatly stimulated. Thus, in the new-born infant there is a normal increase in the circulating lymphocytes, which is further intensified by the ultraviolet light. Ilhan [10] found in giving erythema doses of ultraviolet light to children that there was a lymphocytosis at the expense of the polymorphonuclears, while in rachitic children there was an increase of the polymorphonuclears at the expense of the lymphocytes. Here under the same conditions, the health of the subject directly influences the effect on the blood picture, which corresponds to the results obtained in the new-born infant, when the more active system is consequently stimulated to a greater extent.

In the study of the differential count of the polymorphonuclears, according to Cooke's [11] classification, the cells are immature in the new-born infant. The single lobed nucleated cells, or class 1, are greatly in preponderance, and no multinucleated cells of class 4 appear until the ninth day. The weighted mean begins at 1.28 and gradually ascends to 2 by the tenth day.[12] This is a steady increase toward 2.74, the average adult mean. Classes 2 and 3 gradually increase at the expense of class 1 as the cells mature. In the differential count of the polymorphonuclears of the irradiated infants, there is a sharp decrease in the cells of classes 3 and 2, with an increase in class 1. Class 3 cells disappear for three days following ultraviolet radiation, and then when the cells of class 2 have reached a suitable maturity, class 3 cells begin to return slowly to a normal value.

The polymorphonuclear population of the blood vessels is only a fraction of the whole population of circulating polymorphonuclears in

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9. Miles, A. L., and Laurens, H.: Physiological Effect of Light and Darkness on the Blood, Am. J. Physiol. **75**:443 (Jan.) 1926.

10. Ilhan, F.: The Effect of Ultraviolet Rays on the Leukocytes in Children, Arch. f. Kinderh. **83**:270 (March 23) 1928.

11. Cooke, W. E.: The Life-History of the Neutrophile Polymorphonuclear Leukocyte, J. Roy. Micr. Soc. **47**:29 (March) 1927.

12. To be reported in a later paper.

the body. These cells abound in the extravascular spaces, from which they are continually entering the blood stream and into which they are continually passing from the vessels. The young cells of class 1, and occasionally class 2, are the only ones that are formed in the hemopoietic system. These later mature in the blood stream to the older cells of classes 2, 3 and 4. In the normal new-born infant, the life cycle of the polymorphonuclear has only just begun, hence the slow growth to classes 2, 3 and 4. The effect of ultraviolet radiation on this system is apparently to destroy the normal balance by stimulating the hemopoietic system to the excess formation of young cells of class 1, and to remove the older cells of class 3. Immediately after the first irradiation on the third day, one finds a few cells of class 4 that do not appear normally until the ninth day. This is followed by a loss of older cells in the upper groups, or an absolute disappearance of cells of class 3. The system probably attempts to keep in balance by adding new cells of class 1, which is not so apparent as it really is, because the total leukocytes are decreasing normally in the system of the new-born infant.

A similar unbalancing of the normal system has been effected by Ponder [13] by injecting thyroid extract into rabbits. Colchicine, nucleic acid and trypsin also cause a polymorphonuclear leukocytosis and a similar deflection of the normal count. Kennedy and Grover [14] have obtained similar results with single roentgen exposures, and Kennedy and Thompson [15] obtained a removal of the higher classes of leukocytes with a compensatory increase in young cells of class 1 by exposing rabbits to ultraviolet light.

It has been assumed that the principal blood-forming area was the bone marrow. In the injection of thyroid extract, or any of the hemopoietic stimulants, into the blood stream, the increase in young calls of class 1 could be effected by bone-marrow stimulation. The bone marrow could also be influenced by the roentgen ray. The absorption of ultraviolet light from the skin is great, but the tissue penetration is only possible for a short distance, so that the bone marrow could not be greatly influenced. This would point more to a stimulation of the hemopoietic system to replace older forms destroyed, than to a mere formation of new cells.

13. Ponder, Eric: Studies on Arneth Count: Deflection of Count by Thyroid Injections, Quart. J. Exper. Physiol. **16**:227 (Aug.) 1926.

14. Kennedy, W. P., and Grover, C. A.: Studies on the Arneth Count: Deflection of the Count by X-Ray, Quart. J. Exper. Physiol. **18**:79 (July) 1927.

15. Kennedy, W. P., and Thompson, W. A. R.: Studies on the Arneth Count: Deflection of the Count by Ultraviolet Rays, Quart. J. Exper. Physiol. **18**:263 (Dec.) 1927.

SUMMARY

1. Short exposure to the ultraviolet light increases the total white cell count to a slight extent, the lymphocytes being increased at the expense of the polymorphonuclear leukocytes. There is a rapid return to normal.

2. Short exposures to the ultraviolet light tend to increase the number of young or single lobed nucleated cells of the polymorphonuclears. The older or multilobed forms are decreased. There is a rapid return to normal.

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THE GENERAL HEALTH AND MENTAL ACTIVITY OF ALLERGIC CHILDREN *

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In a recent work [1] on the hereditary factor in allergic diseases, the rôle played by heredity in determining the general health of allergic patients was studied in a series of 1,217 patients, most of whom were adults. From the history and from physical and laboratory observations, it appeared that only 7.2 per cent of all patients were below normal, and that 74.9 per cent were above normal in general health. From my observations I was led to believe that patients suffering from allergic diseases have a superresistance to pathogenic organisms. The mental activity of forty allergic and forty nonallergic children was studied. Seventy per cent of the allergic children were above normal, which is in marked contrast to 15 per cent of the nonallergic children whose mental activity was above normal. From the observations it appeared that allergic children are above normal in mental activity. The furtherance of my study of the general health and the mental activity of allergic patients is undertaken to determine whether or not my former results would be verified in a larger series. A study of the general health of 323 allergic children, in all of whom the hypersensitive condition was demonstrated by positive intradermal tests, is now being presented, along with a study of the mental activity of eighty allergic and eighty nonallergic children.

GENERAL HEALTH OF ALLERGIC CHILDREN

When the physician elicits the past history of allergic children, parents frequently say that the child has been ill a great deal, but on close questioning, one usually finds that other than hay-fever or asthma or some allied condition, namely, eczema, urticaria or migraine, the child has been exceptionally free from the usual diseases of childhood. It is not unusual to have parents say that their asthmatic child has had frequent attacks of bronchial pneumonia; on close questioning, however, one finds that the disease disappeared almost as quickly as it appeared,

* Submitted for publication, Dec. 29, 1928.

* Chairman's address, read before the Biological Section, Oklahoma Academy of Science, Nov. 30, 1928.

1. Balyeat, Ray M.: The Hereditary Factor in Allergic Diseases, with Special Reference to the General Health and Mental Activity of Allergic Patients, Am. J. M. Sc. **176**:332, 1928.

which means that there was a mistake in diagnosis. Asthma in childhood frequently is associated with a fairly high temperature, which makes it difficult to differentiate from true bronchial pneumonia. Seven or 8 minims (0.42 or 0.50 cc.) of epinephrine hydrochloride given hypodermically will relieve sympoms of labored breathing if the condition is an asthmatic attack; however, it will not change the symptoms if the condition is true bronchial pneumonia. Of the 323 cases under consideration, 253 or 78.35 per cent, of the patients were above normal; fifty-four, or 16.7 per cent, normal, and only sixteen, or 4.95 per cent, appeared below normal. The history and the physical and laboratory observations were taken into consideration in classifying these cases. Those placed in the classification "above normal" were cases in which the patients had had practically no diseases of childhood. Under the classification "average normal" were listed the cases in which the patients had had what I consider the average number of diseases of childhood, with moderate severity. Under the classification "below normal" were

TABLE 1.—*Summary of General Health of 323 Allergic Patients*

	Above Normal		Normal		Below Normal	
	Number of Patients	Per Cent of Total	Number of Patients	Per Cent of Total	Number of Patients	Per Cent of Total
Allergic children.....	253	78.35	54	16.7	16	4.95

placed those patients who had a larger number of contagious and infectious diseases than usual and who seemed somewhat delicate in general. From the figures just presented one is led to conclude that a large percentage of allergic children are normal or above normal in general health and that they have a superresistance to pathogenic organisms.

MENTAL ACTIVITY OF ALLERGIC CHILDREN

Many untreated asthmatic children, owing to the large number of attacks, are out of school from one third to one half of the time, and yet their records show that they have passed their grades with ease. In the first study of the mental activity of allergic children a list of the patients living in Oklahoma City, on whom a hypersensitive condition was demonstrated by a positive intradermal test, was given to a statistician of Oklahoma city schools. The children studied ranged in age from 6 to 12 years. The statistician reported the intelligence quotient of forty of these patients. He also reported the intelligence quotient on a similar number of nonallergic children who were chosen consecutively from two schools in the better sections of the city. The Otis self-administering test of mental activity was the one used in determining the intelligence

quotient on the eighty students studied. The classification used is Dr. Terman's, the one generally accepted for this work, and is as follows:

Below normal	70 - 90
Normal	90 - 110
Superior	110 - 120
Very superior	120 - 140
Near genius	140 +

The present study comprises eighty allergic children, who live in Oklahoma City, Tulsa or Okmulgee, and eighty nonallergic students selected from three of the better schools of Oklahoma City, in all of whom the hypersensitive condition was demonstrated by positive intradermal tests.

TABLE 2.—*Summary of Intelligence Quotient on Eighty Allergic and Eighty Nonallergic Students*

	Allergic	Nonallergic
Below normal:		
Number of students	None	8
Per cent of total	.....	10.0
Normal:		
Number of students	25	52
Per cent of total	31.25	65.0
Superior:		
Number of students	31	8
Per cent of total	38.75	10.0
Very superior:		
Number of students	23	11
Per cent of total	28.75	13.75
Near genius:		
Number of students	1	1
Per cent of total	1.25	1.25

The following report was given on the eighty consecutive nonallergic students. Eight, or 10 per cent, of these eighty were below normal; fifty-two, or 65 per cent, fell in the normal group; eight, or 10 per cent, in the superior group; only eleven, or 13.75 per cent, in the very superior, and one, or 1.25 per cent, in the near genius group. In rather marked contrast to this report it was noted that none of the eighty allergic students were below normal; twenty-five, or 31.25 per cent, fell in the normal group; thirty-one, or 38.75 per cent, in the superior; twenty-three, or 28.75 per cent, in the very superior, and one, or 1.25 per cent, in the near genius class. In other words, 68.75 per cent of the allergic students were superior, very superior or near genius, in contrast to 25 per cent of the nonallergic students who fell in these three classes. These figures without question are somewhat striking, but are in close agreement with the observations on the smaller group studied a year ago. From the foregoing considerations, one is led to conclude that the mental activity of allergic children is far above the average normal.

To give an answer to the question as to why children with hay-fever and asthma, or those suffering from some other form of allergy should

have a superior resistance against infectious diseases and have brain cells apparently more active than the nonallergic child is not easy. I wish to offer the following explanation as a possible answer. A person who inherits the ability to become specifically sensitive to cats' hair, orris root, pollen, food protein or some other atopen, has a body that is made up of cells which are hyperirritable or hyperactive compared with the normal, since in many cases the atopic bodies are formed on first contact with the atopen. It is true that the formation of antibodies and atopic bodies is two separate and distinct processes; however, they are similar in nature. If this is true, it would be logical, then, to believe that a person whose cells develop atopic bodies with ease, would also develop antibodies against pathogenic organisms with similar ease. Therefore, an allergic child should, early in life, develop a larger number of specific antibodies against pathogenic organisms than a nonallergic one, thereby giving the former greater resistance against diseases in general. Allergic children, therefore, should be above normal in general health, and it appears that they actually are. The brain cells of the allergic person may be irritable or hyperactive compared with the normal, which might also count for the hyperactive mind of the allergic child. The psychologists teach that mental alertness depends to a large extent on the number of synapses of the brain cell; however, this is only a theory.

PRACTICAL APPLICATION OF OBSERVATIONS

A knowledge of the observations noted may be of importance from a practical standpoint, since many physicians in examining allergic children do much unnecessary examining of the sinuses and chest by the roentgen rays. They frequently spend a great deal of unfruitful time and energy in various types of laboratory work trying to find out the cause of the asthmatic attacks. Needless surgical measures, especially operations on the nose and throat, are frequently carried out. A careful detailed history of the child with asthma or hay-fever will usually tell one whether or not the patient requires laboratory study other than testing and retesting for a specific sensitivity to the atopens to which he is sensitive. The fact that more than 90 per cent of all the allergic children seen by me were normal or above normal, except for their allergic symptoms, is fair evidence that the vast majority of children brought to physicians for relief from some allergic disease do not need a great deal of laboratory investigation other than careful testing for the atopens to which they are specifically sensitive.

As most allergic children are above normal in general health and as their mental activity is far above normal, the treatment of these patients is interesting, for children with asthma or hay-fever and those suffering from some other allergic condition, are usually superior to other children, when relieved of their symptoms, and will cope with the problems

of life with comparative ease, thus differing from patients suffering from most of the other chronic diseases. Therefore, if study and treatment in other chronic diseases are worthwhile, and they are, although in many cases the outlook is frequently not bright, how much more is one justified in a careful study and treatment of allergic children?

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THE INCIDENCE OF CONGENITAL SYPHILIS AMONG DEPENDENT CHILDREN *

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In view of the statement of Stokes [1] that from 3 to 5 per cent of all children are syphilitic, we have been interested in determining the incidence of syphilis among dependent children. For this purpose, we have carefully studied the histories of 1,000 children under the care of the Associated Medical Clinic in Philadelphia. This is a clinic supported primarily by the Children's Aid Society of Pennsylvania, the Children's Bureau (of Philadelphia), the Society for the Prevention of Cruelty to Children, the Seybert Endowment and other agencies interested in Child Welfare, in cooperation with the Children's Hospital for the study of the children under their charge. From 6,000 to 8,000 visits a year are made to this clinic. Practically all of these children are "dependent," that is, there has been some family catastrophe which has made necessary the care of these children by some child-caring or child-protective agency. Thus, there are available figures which should give fairly accurate information as to the incidence of syphilis among this group.

The children studied have been from 4 months to 16 years of age. Seven hundred and ninety-one (or 79.1 per cent) were white, 208 (or 20.8 per cent) were negro children, and there was one whose color was uncertain. Complete social analyses of the family situation are usually available to the physicians of the clinic, and there is an unusual cooperation between the medical staff and the social workers from the children's agencies. The physical examinations have been thorough and have been made by the permanent staff of the clinic. Practically all of the Wassermann tests have been made by the same pathologist at the same laboratory, and the Kolmer technic has been used.

One would suspect among a group of dependent children, where there has been considerable instability of family life, that there would be a larger number giving a positive reaction to the test of the blood than among a corresponding number of children fortunate enough to have a home life of their own. We have also been interested in determining the number of illegitimate children found among these 1,000 children,

* Submitted for publication, Jan. 26, 1929.

* From the Associated Medical Clinic of Philadelphia.

1. Stokes, John H.: Modern Clinical Syphilology, Philadelphia, W. B. Saunders Company, 1926, p. 999.

and the incidence of syphilis among them. Many other studies suggest themselves in a group of this kind, but in this paper we have endeavored to limit ourselves to the study of syphilis both in the group as a whole and among the children of illegitimate birth.

We have classified our observations as follows: (*a*) children who gave undoubted 4 + Wassermann reactions; (*b*) children who gave doubtful (1 +, 2 + or 3 +) reactions; (*c*) children who gave definitely negative reactions.

Twenty-three, or 2.3 per cent, of the 1,000 children examined gave a reaction of 4 + (or more); six, or 0.6 per cent, gave a doubtful reaction; 971, or 97.1 per cent, gave a negative reaction.

Eleven (47.8 per cent) of the twenty-three children who gave a positive reaction to the Wassermann test were white and twelve (52.2 per cent) were black. But the percentage incidence compared to total numbers of white and negro children studied was 1.39 for the white children and 5.77 for the colored, or 4.15 per cent greater for the latter. Considering these twenty-three children who gave positive reactions to the Wassermann test, we found that there were three who probably had acquired primary syphilis; one of these, a colored girl, aged 13, who had a syphilitic eruption, was pregnant.

Thus in this study of 1,000 children twenty cases of congenital syphilis (2 per cent) and three of acquired syphilis (0.3 per cent) were found. None of these children were brought to the clinic because of acute illness, so that these figures probably represent a fairly accurate idea of the incidence of syphilis among dependent children.

The diagnosis of congenital syphilis is frequently a matter of great difficulty, especially after the first few months. We have had many children in the clinic whose family history was unimportant, and who failed to present any of the so-called stigmas of syphilis. In such a case one is compelled to rely on the serologic reactions and on the roentgen studies of the bones to determine the diagnosis.

Ten of these twenty-three children were noted as being within normal limits of weight; five were more than 7 per cent underweight; four were 10 per cent or more overweight, and in four the weight on the first visit was not recorded. In only four of the group was there a history of syphilis obtained in one or both parents. Two of the children were definitely feebleminded; one was questionably feebleminded; five were "dull normal," and one was mentally retarded. In one family, one brother of the child studied was high-grade feeble-minded, one sister a moron and one sister a dull normal. A Wassermann test of the spinal fluid of these children had not been made in the clinic.

A special study of 200 of these children between the ages of 4 months and 5 years shows that among these 200 infants studied consecutively (alphabetically) there were three infants who gave a positive reaction to

the Wassermann tests and one who gave a doubtful positive reaction. Two of these three (aged 1 year, and 4 years and 4 months) were children of the same syphilitic mother. The other was 8 months of age). Two were white and one was colored. This gives an incidence of syphilis in this age group of 1.5 per cent.

The percentage of illegitimacy among the children of this age group was strikingly high, 105, or 52.5 per cent, of the 200 children being of illegitimate birth (this included ten foundlings who were presumably illegitimate). (Seventy-five of this group were white and thirty were colored). It is a curious observation that not one of this group of illegitimate children gave a positive reaction to the Wassermann test of the blood or showed clinical evidence of congenital syphilis.

Among the remaining 800 children studied, there were sixty-eight (forty white and twenty-eight colored) of illegitimate birth; and of these, one (E. C., white, aged 9) gave a positive reaction to the Wassermann test and showed evidences of congenital syphilis. Thus among the total of 1,000 children studied, there were 173 illegitimate children (17.3 per cent), only one of whom showed evidence of congenital syphilis. One begins to wonder whether the type of prostitution resulting in illegitimate children is changing.

The incidence of syphilis among children has been made the subject of several studies. J. S. Lawrence [2] made an investigation of congenital syphilis in institutional children, including 11,205 from 2 to 21 years of age (average 10 years). His results were as follows: positive Wassermann (4 +) reactions, 2.3 per cent (some of these appeared to be healthy normal children); doubtful Wassermann (including 1 +) reaction, 28.5 per cent; negative Wassermann reactions, 68 per cent (some of these had suggestive symptoms); unsatisfactory, 1.2 per cent.

Barenberg and Rosenberg [3] made a study of the Wassermann reaction in a large Jewish institution for the care of children (the age ranging from a few days to 6 years) with the following results: Of 830 Wassermann tests on 472 children, all the reactions were negative. Of 399 syphilitic reactions on 350 of these 472 children, the results were: 321 repeatedly gave negative reactions; three (Wassermann reactions on the parents of these were all negative) gave positive Wassermann reactions; twenty-six gave doubtful negative reactions.

The incidence of congenital syphilis in children in the hospital or outpatient department apparently varies widely, depending on the district in which the studies were made. Thus Royster,[4] in a large children's clinic

2. Lawrence, J. S.: Congenital Syphilis in Institutional Children, J. A. M. A. **78**:566 (Feb. 25) 1922.

3. Barenberg, L. H., and Rosenberg, P.: Arch. Pediat. **39**:23, 1922.

4. Royster, L. T.: Statistical Report of the Incidence of Congenital Lues in a Norfolk (Va.) Children's Clinic, Am. J. Syph. **5**:131, 1921.

in a southern city (population 65 per cent white, 35 per cent negro), studied 1,000 consecutive Wassermann reactions with the following results: of 659 negro children, 15.5 per cent gave positive reactions; of 341 white children, 7 per cent gave positive reactions. The age incidence of the 125 children who gave positive reactions to the Wassermann tests was as follows: under 12 months, thirty-five; from 1 to 5 years, fifteen; from 5 to 15 years, seventy-five.

The same high incidence of congenital syphilis in colored infants of the hospital class was found in an interesting study made in St. Louis by Jeans and Cooke.[5] The Wassermann reaction of 2,030 unselected infants showed that: 15 per cent of negro children gave positive reactions; 1.8 per cent of poor whites gave positive reactions; 1 per cent of better class whites gave positive reactions.

COMMENT

Two of the more frequent questions asked by visitors to the Associated Medical Clinic are, "How frequently is syphilis found among these dependent children?" and "Do you practice or advise a routine Wassermann test on every child brought for examination?" The answer to the first question is summarized in this paper. The answer to the second question is more difficult and is usually given as follows:

> It has become increasingly our practice to secure a Wassermann test of the blood on every child unless the social worker believes that, owing to certain conditions, it is inadvisable at the time to have a test made. Often the test is not made until the second or third visit, as in medical work with dependent children we deem it very important to form a friendly contact with the child as early as possible. The taking of blood for a Wassermann test frequently causes pain in a small child and consequently distrust of the physician and the clinic at the first visit. We have, however, become so convinced of our inability to diagnose congenital syphilis from its clinical signs that we believe it a good policy in a clinic of this nature to make this test on every child within the first few weeks of his attendance.

When the Wassermann reaction is positive, the test is always repeated before the institution of treatment.

CONCLUSION

A study of the Wassermann reaction of the blood in 1,000 dependent children between the ages of 4 months and 16 years showed that twenty-three, or 2.3 per cent, gave definitely positive reactions. Three of these children had lesions of acquired syphilis, so that the incidence of congenital syphilis was 2 per cent.

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5. Jeans, P. C., and Cooke, J. V.: A Study of the Incidence of Hereditary Syphilis, Am. J. Dis. Child. **22**:402 (Oct.) 1921.

The percentage of positive Wassermann reactions was four times greater for the colored than for the white group.

The percentage of illegitimacy among a group of 200 young dependent children (from 4 months to 5 years of age) disclosed the unusually high figure of 52.5 per cent; but among this group there was no positive Wassermann reaction.

Among the entire group of 1,000 dependent children, the percentage of illegitimate children was 17.3 per cent, and of these only one gave a positive reaction.

The physical signs of congenital syphilis are often so obscure that it would seem advisable, at least in a clinic for dependent children, to perform a Wassermann test of the blood on every child.

CERVICOVAGINITIS

A STUDY OF TWO HUNDRED AND NINETY-SIX CONSECUTIVE CASES *

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CHICAGO

Genital inflammation in young girls is one of the most neglected and poorly managed conditions of today. This is partly due to negligence or reticence on the part of the child's mother or guardian, and partly due to the fact that most general practitioners and many pediatricians as well are too disinterested in the condition to devote the necessary time and pains required for adequate treatment.

With a clearer conception of the underlying pathologic process, and a direct and effective method of treatment at hand, greater interest will be shown in inflammatory lesions of the female genitalia, and in consequence far better results will be obtained than heretofore. Because cervical inflammation is an essential part of the pathologic picture in these cases, Norris and Mickelberg [1] suggested that the term vulvovaginitis is misleading. We agreed with these authors. We believe that "cervicovaginitis" is an improvement on vulvovaginitis, and therefore we have adopted it, and we recommend its general acceptance. Alfred Hess [2] has shown by postmortem examination that in subacute and chronic cases of gonorrheal vaginitis in infants, the cervix is most frequently involved. Furthermore, the common characteristics of latency and recurrence exhibited by this disease are due to a persistent gonorrheal cervicitis after the vulvar and vaginal lesions have disappeared.

The lack of a specific remedy for genital infection with the consequent innumerable methods of treatment in vogue is another reason for the unsatisfactory results that are generally obtained. One of us

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* Submitted for publication, Dec. 26, 1928.

* From the Special Vaginitis Clinic in the Mandel Clinic of the Michael Reese Hospital.

1. Norris and Mickelberg: Arch. Pediat. **39**:281, 1922; Diagnosis of Gonorrhea in Female by Staining Methods, J. A. M. A. **76**:164 (Jan. 15) 1921; Therap. Gaz. **39**:775, 1923.

2. Hess, Alfred: Vaginitis in Infants, Am. J. Dis. Child. **12**:466 (Nov.) 1916.

(Stein [3]), in a review of the literature pertaining to the treatment for vulvovaginitis, showed its present chaotic condition and emphasized the need for a simple and effective method of treatment. In the armamentarium of treatment as reported in the literature, the local application of silver salts in solution and paste, instillations of cultures of lactic acid bacilli, mechanical douching and irrigation with antiseptics, the use of vaccines, heat therapy, nonspecific protein therapy or combinations of the foregoing remedies, have been reported with varying results.

ETIOLOGY

Primarily the practitioner must have a clear conception of the etiology of genital inflammation in young girls in order that he regard the condition with the gravity it merits, and he must be willing to treat it with patience and intelligence in order to obtain satisfactory results. The contagiousness of both gonorrheal and nonspecific forms of cervicovaginitis is widely acknowledged. Indirect contact is the rule in young subjects. It is important that adult members of the family be regarded as the likely sources of infection in gonorrheal cases. That inadequate hygiene is a significant predisposing factor in nongonorrheal cases cannot be denied, and the rôle of contaminated sponges, towels, toilets, thermometers, soiled hands of attendants, etc., must be constantly borne in mind. Many infections with *B. coli,* streptococci and pyogenic organisms are due to contamination from the stool. Inquiry often reveals that many girls cleanse the anus from behind forward thus dragging fecal matter over the vulva, and the lack of local immunity in these delicate and relatively unprotected tissues predisposes to genital infection. Mechanical and chemical irritation from masturbation and the introduction of foreign bodies into the vagina is a less common source of cervicovaginitis, but is nevertheless a factor. Rape must also be considered in the etiology. In our series, two girls with persistent sticky, brownish discharge were found on roentgen examination to have safety-pins high in the vaginal vault. Stöber [4] found in the vagina of a girl 2½ years of age two cherry stones, two pebbles, two splinters of wood and other foreign bodies, including a number of pieces of coal. Rectal gonorrhea in infants of either sex may be the etiologic factor in a hospital epidemic.[5]

The exact percentage of gonorrheal infections in any series of genital infection depends on the source of the material. In an outpatient clinic such as ours, the conditions are chiefly chronic, many of the patients having been treated elsewhere before registering with us. In

3. Stein, Irving F.: Surg. Gynec. Obst. **36**:43, 1923.
4. Stöber, T.: Monatschr. f. Kinderh. **32**:97, 1926.
5. Byfield and Floyd: Arch. Pediat. **41**:673, 1924.

the present series of 296 patients observed over a period of six years, sixty-two (20.97 per cent) had gonorrheal infections; in seventy-nine, the infection was suspected of being gonorrheal, and in 155 it was nongonorrheal. Norris and Mickelberg found gonorrheal infection in 60 per cent of their 400 cases. In reports from boarding institutions, the percentage of gonorrheal infections is usually greater due to the occurrence of epidemics.

PATHOLOGY

Patients with genital inflammation rarely come to autopsy, and if examined post mortem for some other and unrelated condition, the genitals are rarely subjected to microscopic study. Hess' study already referred to is an exception to this rule. At four autopsies he found that the tip of the cervix was red without extension into the canal, and microscopically there was round cell infiltration of the submucous tissue. Chiefly through vaginoscopic examination has the fact that the cervix is the most constant seat of disease become recognized.[6] Redness of the cervix is commonly observed by this means, as is purulent cervical discharge, and ectropion is occasionally seen. The urethra is also a common seat of gonorrheal infection with the Skene's glands involved almost as often as in the adult. Bartholin's glands are rarely affected in young patients, but the outer portion of their ducts may be involved.[1] Vaginitis in infants is a constant lesion. In older girls in whom the vaginal mucosa is more highly developed, no lesions are usually observed, but the surface is covered with purulent discharge. The vulva, labia and vestibule are often red, excoriated and covered with pus or crusts. This is probably secondary to cervical and urethral involvement. When the rectum is involved, the mucosa is reddened, but no swelling or ulceration is observed. A profuse, purulent, yellowish-green discharge is characteristic of both genital and rectal infection.

CLASSIFICATION

As outlined in a previous report (Dorne and Stein[3]), our patients are classified into three groups, as established by the smear diagnosis, namely:

GROUP I: *Gonorrheal Infection.*—Cases in which the smear reveals many pus cells, some of which contain gram-negative intracellular diplococci of typical morphology.

GROUP II: *Gonorrheal Infection Suspected.*—Cases in which repeated smears reveal many pus cells and gram-negative extracellular diplococci only, or no organisms.

6. Rubin and Leopold: The Treatment of Gonococcus Vulvovaginitis with Further Observations on the Value of the Complement Fixation Test in the Management of This Disease, Am. J. Dis. Child. **7**:230 (March) 1914.

GROUP III: *Nongonorrheal Infection.*—Cases in which the smears reveal pus cells, epithelial cells and mixed organisms; cocci, streptococci and bacilli, gram-negative and positive, mostly extracellular.

EXAMINATION AND DIAGNOSIS

For the past three years we have been employing an electric lighted vaginoscope in the examination and treatment of patients with cervicovaginitis. We first used an ordinary female urethroscope, but we found that the small wheat-kernel lamps were not practical, and we now use the instrument shown in the accompanying illustration, which has proved satisfactory. The examination is painless, and requires but little time. One can readily examine the entire vaginal canal by this means, and can inspect the cervix in every case. Smears are taken directly from the cervix and the upper part of the vagina through the instrument, and if topical applications are desirable, they may be made to the cervix and vaginal canal under direct vision.

The routine use of the vaginoscope has not only convinced us that the term cervicovaginitis is more expressive of the exact condition, but has also been a source of more careful study of our patients. We have never experienced any harm or discomfort from its use, and while it is comparable to the cystoscope in its diagnostic significance, it excels it in simplicity of the technic required for its use, for painlessness and for safety. We urge all physicians who undertake to treat patients with vaginitis to adopt this simple and exact means of studying them. They will be rewarded by a more accurate knowledge of the underlying pathologic condition which will stimulate them to proceed with the treatment to its completion. The fear of injuring the hymen, so commonly expressed, is not valid. We have never experienced a tear from this source. In consideration of the cervical pathologic process, the existing prejudice against intragenital examination and therapy must be overcome.

In addition to cervical smears, spreads from the vagina and urethra should be made routinely. We usually spread them on a single slide in letters U-C-V and stain by Gram's method. Tight or moist sterile swabs are satisfactory for obtaining secretion for spreads. As we previously advised,[7] cultures are less accurate for the diagnosis of the chronic infections, and therefore need not be taken routinely. In acute cases or in medicolegal cases, cultures may be required.

TREATMENT

Our treatment consists of daily instillations into the vagina of 1 per cent mercurochrome-220 soluble in equal parts of hydrous wool fat and petrolatum. The hydrous wool fat is an important basic constituent for the ointment because

7. Dorne and Stein: Illinois M. J. **45**:219 (March) 1924.

it absorbs the moisture on the mucosa and gives the ointment a real affinity for the tissue, instead of repulsion between the moist mucous membranes and the usual petrolatum base. Hydrous wool fat also renders the aqueous mercurochrome solution miscible with petrolatum.

The ointment is warmed in a water-bath to facilitate drawing it into the large glass syringe which is used for treatment. A soft rubber tip about 3 inches (7.6 cm.) in length and ¼ inch (0.63 cm.) in diameter is connected to the syringe to be inserted into the vagina up to the cervix, with the child lying in the lithotomy posture. The vagina is then filled with the ointment until the latter begins to

The vaginoscope is used for inspection of the cervix and vagina. Smears are obtained directly from inflamed areas.

ooze back. The syringe is then disconnected, and the rubber tubing is removed by drawing it through the approximated thumb and forefinger so that the contents of the tube are left in the vagina. One syringe full is sufficient for several treatments, only the rubber tip requiring sterilization after each treatment. When several children are being treated in a clinic, a number of rubber tips should be available. The vagina and cervix are examined once each week by means of the vaginoscope (or urethroscope no. 26), and smears are taken from the cervix, vagina and urethra. The urethra is treated with swabs containing 2 per cent aqueous solution of mercurochrome. If Skene's ducts appear swollen and red, the same solution is instilled into them by means of a syringe armed with a blunt tipped soft silver cannula, the same as we use in cases of infection of Skene's

ducts in adults. This procedure is more difficult in infants, but may be imperative to prevent recurrence. In addition to the foregoing treatment, instruction in hygiene, which has been emphasized previously, is deemed by us as a highly important item in therapy. A daily tub bath, and the use of clean closed drawers is urged on all of our patients. Patients with gonorrheal infection should be isolated when possible. In institutions the evacuation or isolation of girls with gonorrheal infection is imperative as a means of prophylaxis. Rectal gonorrhea in male infants should be sought when a hospital epidemic occurs, and when found these infants should be isolated.

The determination of cure is perhaps the most difficult phase of our study. We pursue the daily instillations of mercurochrome ointment until three negative smears are obtained at weekly intervals. Treatment is then stopped and the child is examined vaginoscopically at biweekly intervals, and cervical and urethral smears are taken. The latter observations are continued for a period as long as that of the active treatment. Occasionally, provocative silver nitrate applications are made to the cervix, and repeat smears are taken after forty-eight hours. Follow-up examinations are made every two months for six months. The vaginoscope has again been found valuable in our follow-up examinations to detect recurrence; foreign bodies may also be visualized.

Analysis of 296 Cases of Cervicovaginitis

Type of Infection	Number of Patients	Weeks of Treatment	Patients Examined After 3 Months	Cures, per Cent	Recurrences, per Cent
Gonorrheal	62	11.1	23	78.3	21.7
Gonorrheal suspected	79	6.2	26	88.5	11.5
Nongonorrheal	155	5.0	26	100.0	0
Total	296	7.4	75	89.3	10.7

In 1924, we reported the cases of seventy-three patients with cervicovaginitis, eighteen of whom had gonorrheal infection; the latter were discharged as cured in an average of 9.7 weeks. Fifteen patients in whom gonorrheal infection was suspected were discharged as cured in an average of 6.5 weeks. The forty patients with nongonorrheal infections were discharged as cured in an average of five weeks. Since the foregoing report we have treated 223 additional patients in the special vaginitis clinic in the Mandel Clinic of the Michael Reese Hospital, of whom forty-four, or 19.7 per cent, had definite gonorrheal infection; in sixty-four, or 28.7 per cent, gonorrheal infection was suspected, and in 115, or 51.6 per cent, it was nongonorrheal. A study of this additional material shows that less than one fifth of the patients suffered from gonorrheal infection, and that in over one-half the infection was definitely nongonorrheal. The average duration of active treatment of our total 296 patients was 7.4 weeks (table). Of these, the patients with gonorrheal infection required treatment on an average of 11.1 weeks; those in whom the infection was suspected, 6.2 weeks, and those with nongonorrheal infection, five weeks.

The treatment in the second series averaged somewhat longer than was reported in our earlier study owing to the fact that in the third year of the clinic we tried out stronger mercurochrome ointments instilled twice weekly. Our results were less satisfactory with this scheme and we returned to the original plan of daily instillations of the 1 per cent ointment. Of twenty-three patients with gonorrheal infection who returned after three months, eighteen were cured, and five, or 21.7 per cent, had recurrence. Of twenty-six patients suspected of having gonorrheal infections who returned, twenty-three were cured, and three, or 11.5 per cent, had recurrence; of twenty-six patients with nongonorrheal infections, all were cured.

In the ultimate analysis it should be emphasized that in a definite percentage of children, the vaginal discharge is gonorrheal. In our series this proved to be 20.97 per cent. Fully one half of our patients had nongonorrheal infections. This percentage naturally varies with the clientele and also with the occurrence of epidemics. In the first two weeks of life, and particularly a few days after birth, a mucous discharge containing pus cells and intracellular diplococci is occasionally observed. This condition is sometimes erroneously diagnosed as a gonorrheal infection, but no gonococci are found. The organism in such cases is often *Micrococcus catarrhalis*, which stains similarly to the gonococcus with Gram's method. The differentiation is made by cultural characteristics, fermentation tests and clinical course. Such discharges are more commonly encountered in maternity hospitals than in outpatient clinics.

Gonorrhea is very resistant to treatment and offers greatest concern both to the parents and to the physician. A common question asked by the mother at the clinic is, "Will this infection prevent childbearing in later life?" The reply is that complications of cervicovaginitis are fortunately extremely rare. In regard to the late sequelae of cervicovaginitis, there is no definite evidence that the infection persists in a latent stage beyond puberty. Occasionally one sees evidence of marked chronic endocervicitis in a single girl during adolescence or early adult life. In such cases one naturally inquires concerning a history of vaginal discharge in infancy, but such a history is rarely obtained. Kielberg Roumanus [8] examined twenty women and girls who as children had gonorrheal vulvovaginitis, and he found no vestige of the disease. Most of his patients were still too young for him to draw conclusions as to sterility. He concluded that gonorrhea must cure itself or become latent, otherwise infection of the male at the first intercourse would be frequent. However, we must bear in mind that the organism may be of such low

8. Romanus, Kielberg: Dermat. Wchnschr., 1917, p. 64.

virulence as to prove to be noninfective to another adult. Koplik,[9] in 1923, reported several cases of patients who had gonococcic vaginitis during childhood and who afterward married and bore children. In the same report, he cited four instances of fatal gonococcic peritonitis in the course of vaginitis in young girls. Our experience coincides with that of Meister,[10] who found that in infants the complications are few and usually not serious, such as dermatitis and inguinal adenopathy. In older girls, any of the complications common to gonorrheal infection in the adult may occur, as salpingitis, peritonitis and systematic involvement, such as arthritis, endocarditis and pericarditis. Gleich [11] reported a case of gonococcal peritonitis in a girl 4 years of age, and Joannides,[12] one in a girl 6½ years of age, who was infected by her mother. Proctitis occurred in two of our cases, and the patients were successfully treated by mercurochrome rectal suppositories. We again emphasize that proctitis in male infants may be the source of epidemic cervicovaginitis in girls in children's hospitals.

SUMMARY

1. The use of the vaginoscope is recommended for the careful study and treatment of young girls with genital inflammation.

2. Cervical involvement is an essential part of the underlying pathologic process in cases of so-called vulvovaginitis. This is appreciated after vaginoscopic study. The urethra is frequently similarly involved.

3. Because of the foregoing facts, the term cervicovaginitis has been adopted by us to replace the term vulvovaginitis.

4. It is obvious that treatment must be given directly to the cervix and urethra in order to insure absolute cure.

5. About one fifth of our cases of cervicovaginitis were of gonorrheal origin.

6. The treatment with mercurochrome ointment described here is a simple and effective method of treatment in all varieties of cervicovaginitis.

7. The duration of treatment with 1 per cent mercurochrome ointment of the patients with gonorrheal infection was 11.1 weeks, while

9. Koplik: Am. J. Obst. **68**:600, 1913.

10. Meister, W. B.: Am. J. Obst. **61**:540, 1910.

11. Gleich, M.: Gonococcal Peritonitis Complicating Gonorrheal Vulvovaginitis, J. A. M. A. **86**:748 (March 13) 1926.

12. Joannides, M.: Bilateral Gonorrheal Salpingitis in a Child Three Days After Initial Infection, J. A. M. A. **86**:1518 (May 15) 1926.

those in whom the infection was suspected and those in whom it was nongonorrheal were cured in less than one-half the time.

8. There was recurrence of discharge after three months in about 20 per cent of the patients with gonorrheal infection. There was no recurrence in those in whom the infection was nongonorrheal.

9. Determination of cure, facilitated by the use of the vaginoscope, requires a long period of observation after cessation of the active treatment.

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THE DEVELOPMENT OF THE HUMAN FOOT AS AN ORGAN OF LOCOMOTION *

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During the past year, I have been engaged in a study of the development of the feet of fifty children between the ages of 18 months and 4 years at the Institute of Child Welfare of the University of California. Although the research is still in progress and the number of cases thus far studied is small, a preliminary report of the work seems appropriate at this time, first, because a careful review of the existing literature indicates that attention should be called to the gaps in the knowledge of the functional development of the foot as an organ of locomotion, and second, because in the course of the investigation it was necessary to devise a new method, the description of which may be useful to others who are confronted with the problem of the accurate evaluation of foot function in children or adults.

Despite the increasing substitution of other means of locomotion for walking, the importance of the human foot as an organ of support and propulsion is still sufficient to inspire a considerable literature. Thus, in a monograph on flatfoot, which appeared in 1925, Cramer [1] gathered together more than 1,000 references, and it is safe to suppose that several hundred have been added since that date.

It is perhaps not surprising that in this literature the diagnosis and treatment of structural and functional conditions in adults receive the greatest attention. Several studies of conditions of the feet among school children are reported, but there is little on the conditions of the feet of children of preschool age; and there are practically no data concerning the normal functional development of the foot during the first decade of life.

It is evident also that attention has been focused mainly on the weight-bearing function of the foot and that little has been reported concerning the development of the equally important propulsive function. Furthermore, even in this limited field of observation and measurement, there is a striking variation of definition and a correspondingly great discrepancy among the observations of the several investigators. Thus, Roberts [2] examined 10,000 school children between the

* Submitted for publication, Dec. 26, 1928.

1. Cramer, C.: Der Plattfuss, Ferdinand Enke, Stuttgart, 1925.

2. Roberts, P. W.: Prevention and Treatment of Weakfoot in Children, J. A. M. A. **75**:237 (July 24) 1920.

ages of 8 and 12 years and found flat feet in 4.3 per hundred; among 250 children, Roth [3] found 65 per cent with flat feet; Wassermann [4] examined 500 children between the ages of 6 and 16 years and found 40 per cent with flat feet; in 600 children Ewald [5] saw 33.3 per cent with flat feet; Brahdy [6] found flat feet in 19 per cent of his patients in a preschool clinic; in a public health report published by the United States Treasury Department [7] in March, 1925, 78 per cent of the school children examined were defined as "weak footed."

In view of these discrepancies, it is not surprising that I searched in vain for an appropriate method which would yield reliable objective data concerning not only growth and configuration, but also certain functional changes in the use of the foot in walking. The objective methods which have been used fall into three classes: (*a*) direct measurements, (*b*) x-ray photographs and (*c*) footprints. While the first two methods give results in congenital anomalies or if a faulty function has worked long enough to produce anatomic changes, the last method is used to judge the function of the longitudinal arch during standing. But even for this elective purpose, the authors do not agree as to the value of the method. Lewin [8] said in his paper: "The value of footprints has been overestimated both from the standpoint of diagnosis and progress. The print of the new-born infant is misleading in that it usually looks flat. In fact, the foot of a new-born infant, if cross sectioned, will reveal a definite bony arch obliterated by a fat pad. One may find a foot (in an adult) with a high arch, but in apposition of pronation."

Concerning the study of the development of walking in young children, it is interesting to note that Vierordt,[9] in 1881, investigated the time phases of the step by means of especially constructed shoes so that the pressure of the foot on the ground was recorded on a revolving kymograph. In her work on the coordination of locomotion in infants, Lenoir Burnside [10] used a path of ink-bleached muslin on a linoleum foundation, the whole being covered with thin brown paper so as to record the impress made by the feet in walking along the path. The data

3. Roth, cited by Cramer (footnote 1).

4. Wassermann, cited by Cramer (footnote 1).

5. Ewald: Ueber den Knick und Plattfuss, Ztschr. f. Orthepaed. Chir., 1910, vol. 25.

6. Brahdy: Flat-Foot in Children, Arch. Pediat. **44**:86, 1927.

7. Foot Defectiveness in School Children, Pub. Health Rep., March 27, 1925.

8. Lewin, P.: Flatfoot in Infants and Children, Am. J. Dis Child. **31**:704 (May) 1926.

9. Vierordt, H.: Der Gang des Menschen, Tuebingen, 1881.

10. Burnside, L. H.: Coordination in the Locomotion of Infants, Genetic Psychology Monographs, September, 1927, vol. 2, no. 5.

obtained from these experiments included length of step, width of step, time length of step, and the angular placement of the feet with regard to the line of progression.

TECHNIC

Since no one of these methods, nor any combination of them, is adequate for the routine study of the anatomic growth and the functional development of the foot, I have evolved the following technic which has thus far proved practical, reliable and flexible, and which yields objective data as a basis for interpretation.

The footprints while walking are taken first. The subject steps in powdered French chalk contained in a shallow box, and then walks about the room. The floor is, of course, uncarpeted, and a dark, smooth surface yields the clearest imprints. Fastened to the floor with thumb tacks are several sheets of heavy black paper, each 20 by 26 inches. The paper, known as black antique Buckeye, has sufficient body and roughness to take the powder prints well. The subject walks across these sheets of paper, and the prints obtained are carefully compared with those on the floor. If they do not conform with these in all details, they are erased with a few strokes of a soft cloth and the subject walks across again. When the powder marks on the paper are a fair sample of the characteristic footprints of the subject while walking, the examiner passes on to the next step and records the footprints while the child is standing and while he is sitting. These are recorded on the same sheet with the prints made while walking. When the footprints are made while the subject is standing, he remains in position for a full minute, because it has been found that during the first thirty seconds of standing the contours of the foot alter appreciably. Changes also occur after one minute,[11] but for young children a more prolonged period of standing is not feasible. In taking the prints while the child is sitting, the examiner holds each ankle and gently lowers the foot into position on the paper so as to avoid pressure due to muscular exertion.

When the three series of prints have been taken, they are fixated by spraying with a solution of shellac in alcohol. So treated and protected by a sheet of tissue paper, the records can be kept indefinitely and used for comparison with those made subsequently.

In making a study of the changes in footprints which occur in children, prints are taken at monthly intervals from the time the child begins to stand alone until a fairly constant form of walking has been developed. Thereafter, prints are taken every three months. Figure 1 shows a specimen form which suffices for recording the readings on three successive examinations.

The measurements taken are shown on the diagram (fig. 2), the linear measurements being recorded in centimeters and the angular measurements in degrees.

The length of the foot (*E-F*) is taken as the distance between the posterior point of the heel and a point in the groove between the base of the first and the base of the second toe. This measurement seems to be more reliable than the length of the foot including the toes, as the length of the imprint of the great

11. Hohlfelder, in a recent paper (Carriage and Body Length in the First Year of Life, Arch. f. Kinderh. **83**:1 [Jan. 5] 1928) described flattening of the longitudinal arch during a standing period of one hour and a half, which even results in a reduction of the standing height from 1 to 2 cm.

DEVELOPMENT
Feet

Case Number.....

4.1 Data collected by..... Dates.....

Given name of child..... Age.....

4.2 Specific impulses:

	First examination		Second examination		Third examination	
	R	L	R	L	R	L
Heel						
Mid-foot						
Ball						
Roll						

Remarks.....

4.3 Measurements:

	First examination		Second examination		Third examination	
Height						
Weight						
Angle bet. feet in walking						
	R	L	R	L	R	L
Eversion						
Heel axis metatarsal angle						
Stride length						

	Right foot									Left foot								
	Sitting			Standing			Walking			Sitting			Standing			Walking		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Length																		
Width at ball																		
Width at heel																		
Height of arch																		

4.4 Remarks.....

UNIVERSITY OF CALIFORNIA—INSTITUTE OF CHILD WELFARE Form D4. May, 1928.

Fig. 1.—Specimen form used in recording development of feet on three successive examinations.

toe varies with function. The width of the ball (*A-C*) is taken as the distance between the inside tangent (*A-B*) and the outside tangent (*C-D*) measured from *A* to *C*. The width of the heel (*B-D*) is taken as the distance between the tangents at *B* and *D*. The metatarsal axis (*H-I*) is taken as a line drawn perpendicular to the line *A-C* midway between *A* and *C*. The heel-axis (*G-I*) is

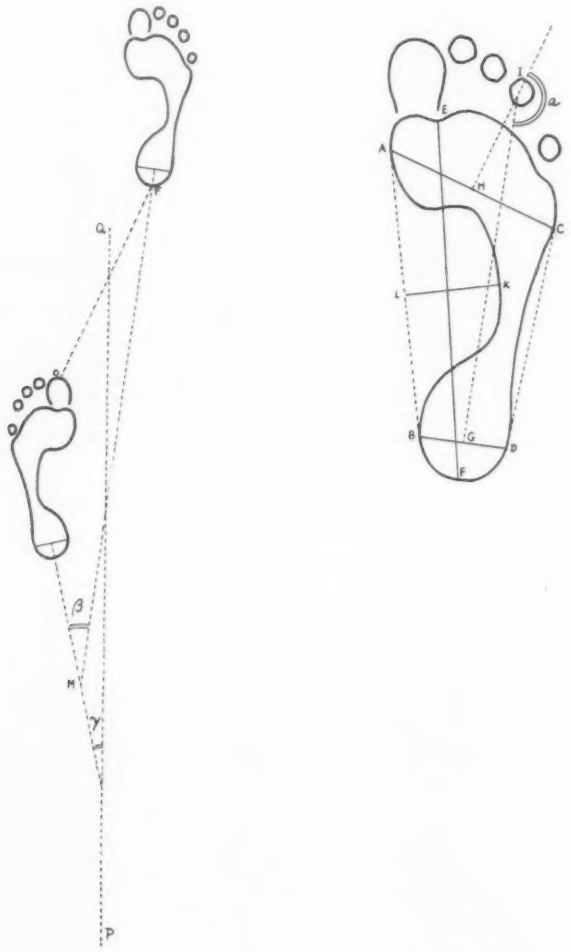

Fig. 2.—Measurements taken. *A-B* indicates inside tangent; *C-D*, outside tangent; *E-F*, foot-length; *A-C*, ball-width; *B-D*, heel-width; *H-I*, metatarsal axis; *G-I*, heel axis; *L-K*, height of arch; *a*, heel-axis-metatarsal angle; *O-F*, length of stride (left to right); *M*, crossing of heel axes; *β*, angle between feet in walking; *γ*, eversion, and *P*, direction of progression.

taken as a line drawn perpendicular to the line *B-D* midway between *B* and *D*. The height of the arch (*L-K*) is taken as the perpendicular distance from the inside tangent (*A-B*) to the deepest point in the indentation due to the longitudinal arch of the foot. The heel-axis metatarsal angle (*a*) is taken as the obtuse

Fig. 3.—Record of child, aged 18 months. No impulses developed.

Fig. 4.—Record of child, aged 3 years. Good foot form; poor function; no impulses.

Fig. 5.—Record of child, aged 2 years. Only heel impulse developed.

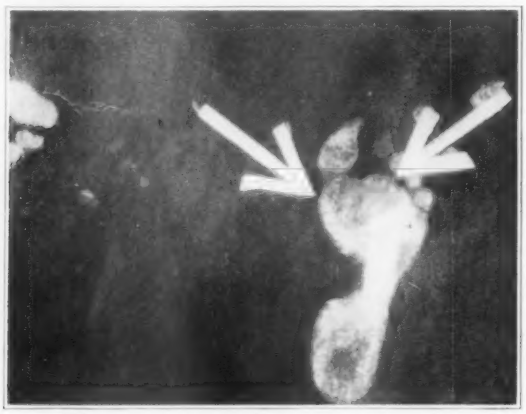

Fig. 6.—Ball impulse from 1 to 4.

Fig. 7.—Fully developed impulses in a foot of a child, aged 4 years.

angle between the heel-axis and the metatarsal-axis The length of stride (O-F) is taken as the distance between the big toe of one foot and the heel of the other foot. The angle between the feet in walking (β) is taken as the acute angle between the two heel axes. Eversion (γ) is taken as the angle between the heel-axis and the line of progression (P-Q).

It is of course understood that these arbitrarily adapted measurements have no direct anatomic significance but serve as a basis for accurate evaluation of the changes which occur in the footprints as the result of growth and altered function.

In addition to the measurements, the prints made while the subject is walking are read on the basis of the pattern of the density of distribution of the powder. At the points of greater pressure during walking, the powder tends to be driven away from the surface of the paper and to accumulate where the pressure is less. Consequently, dark spots indicate areas of greater impulse and

Fig. 8.—Adult foot with split ball impulse. One part of it is seen in the great toe itself.

white areas indicate a condition approaching mere contact between the foot and the paper (figs. 5, 6, 7 and 8). These impulse areas are recorded on the foot chart as to location and probable intensity, the latter being rated on a three point scale.

CONCLUSIONS

From the study of accumulative records of fifty children, from 18 months to 5 years of age, and of six adults, the following tentative conclusions concerning the changing distribution at successive age periods of the points of greater impulse have been drawn:

1. During the early months of walking, and often as late as the twentieth month, no distinct impulse points are shown on the powder prints (figs. 3 and 4).

2. With increasing age the points of impulse increase in number and change in position until the fourth year, when the adult type of walking is usually established.

3. The first point of impulse is developed at the heel; at first this point tends to show nearer the inner than the outer border, but later it usually lies in the midline (fig. 5).

4. The second point of impulse developed is at the ball of the foot, extending in the beginning from the base of the first metatarsal to the base of the second, third, and sometimes the fourth metatarsal but tending to concentrate later at the base of the first metatarsal or beneath the first metatarsophalangeal joint (figs. 6 and 7).

5. The last impulse point to appear is in the midfoot; it tends to move gradually toward the outer border (figs. 6 and 7).

6. About the time that the impulse point appears at the ball of the foot, it is usual to find in the powder print an extension of powder forward from the end of the big toe. This shows as a small and somewhat blurred "powder tower" and indicates that the foot is being rolled forward in walking. Similar powder towers may sometimes be seen beyond the ends of the second and third toes (figs. 6, 7 and 8).

SUMMARY

As the result of a careful survey of the available literature regarding the development of the human foot, it is evident that little is known of the functional changes which take place between the earliest infantile form of walking and the establishment of the adult form of walking.

Among the methods of measurement and examination of the feet heretofore used, I have been unable to find any satisfactory technic for the accurate objective determination of the variations which occur in the use of the foot in walking.

A method has been devised which seems to yield accurate data suitable for cumulative studies on young children and for comparative studies among both adults and children. The technic of the method is fully described, and the interpretation of the data obtained is illustrated.

On the basis of work done during the past year, certain tentative conclusions concerning the development of the foot as an organ of propulsion are reported. Further studies on the development of walking in children and of types of walking among adults are now in progress and will be published at a later date.

THE ANAEROBIC INTESTINAL FLORA OF NORMAL BREAST-FED AND ARTIFICIALLY FED INFANTS*

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Considerable attention has been paid during recent years to the study of the intestinal flora of the breast-fed and the artificially fed infant. In general, investigators are agreed that the predominating intestinal organisms of the breast-fed infant are gram-positive, mostly *B. bifidus*, whereas in the artificially fed infant a greater variety of bacteria are present, most conspicuous of which are those of the colon-aerogenes group. Authors agree, also, that the bacteria of the meconium are of various kinds but that with the disappearance of the meconium stool, the flora merges into that of the typical bifidus-predominating type. Much of the information has been derived from direct smears, from sediments from fermentation tubes inoculated with fecal material and from other cultural methods.

The original object of the present study was to determine what differences, if any, might be found in the intestinal flora as the result of different kinds of artificial feeding. In order to obtain a norm with which such comparisons could be made it was decided to devise a routine examination of material from a number of breast-fed nurslings. Then, by tests made in a similar way on specimens from other infants, fairly reliable data of value to pediatricians might be obtained.

As has been pointed out by Tissier and Dreyfus,[1] the predominating intestinal bacteria of the normal infant are of three types, *Bacillus coli*, *Micrococcus ovalis* (or the enterococcus) and *Bacillus bifidus*. For purposes of comparison, it seemed desirable to devise a method by which one might make a rough estimate of the relative proportion of these typical bacteria, in other words, a "differential count" of microbial types. Such a method has been attempted on direct smears, but with little success. Most experimenters have utilized several kinds of culture mediums, each with reference to a particular organism. Obviously, while such experiments give valuable information, no qualitative com-

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1. Tissier, H., and Dreyfus, S.: Sur les streptocoques de la flore intestinale des nourissons au sein, Compt. rend. Soc. de biol. **92**:476, 1925.

parison can be made between species. Adam and Kissoff [2] used a method for comparing the occurrence of *B. bifidus* with that of *B. acidophilus*. A double set of dilutions was made, one set cultured in deep agar tubes for determinations of *B. bifidus* and the other in aerobic plates for *B. acidophilus*. The results were expressed in the highest dilution in which the organism under discussion was present. Brown and Bosworth,[3] in addition to the study of direct smears, utilized sugar-agar slants incubated in Stitt's vacuum bottle. This gave a good general idea of predominating types, and a single medium was used for all types under consideration. No differential enumeration, however, is possible with slants.

As *B. bifidus* is the most difficult of the three organisms to cultivate, owing to its anaerobic requirements, an anaerobic method is unquestionably necessary. As both *B. coli* and *M. ovalis* are facultatively anaerobic, the question of p_H and enrichment was the only other factor to be considered. Torrey [4] used successfully dextrose-blood-liver-agar in his study of *B. bifidus*. It was found that a sugar-liver-agar without the addition of blood developed satisfactory colonies of *B. bifidus*. Saccharose was selected because it was thought that as the *B. coli* present were mostly nonsaccharose-fermenting, by using an indicator, the colon colonies would be more easily distinguished from the other two organisms which ferment this sugar. Lactose could be used as well. Plates were made of liver-agar, according to the method of Torrey, using 0.5 per cent proteose peptone and 1 per cent saccharose with sufficient bromcresol purple to give a deep violet color with the reaction at p_H 7. It is necessary for the medium to be very clear, for any sediment interferes with the microscopic work done in the course of enumerating the colonies.

THE INTESTINAL FLORA OF BREAST-FED INFANTS

Experimental Data.—For the first part of the study, normal entirely breast-fed infants were selected. Specimens of stools were obtained beginning on the first or second day of life, and were examined daily according to the procedure described. Tests were continued until the fifth or sixth day, or until the typical nursling flora appeared to be definitely established.

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2. Adam, A., and Kissoff, P.: Ernährungsphysiologie des B. acidophilus in Verhältnis zu der des B. bifidus, Ztschr. f. Kinderh. **34**:207 (Nov. 22) 1922.

3. Brown, E. W., and Bosworth, A. W.: A Bacteriologic Study of Feces and Food of Normal Babies Receiving Breast-Milk, Am. J. Dis. Child. **23**:243 (March) 1922.

4. Torrey, J. C.: New Differential Plating Methods for B. Bifidus and B. Acidophilus, J. Bact. **2**:435 (July) 1917.

A fresh specimen was obtained by inserting a sterile tube, about 3 mm. in diameter, in the rectum. Usually, a considerable amount of fecal material was expelled into the tube. The tube was then replaced in the test tube in which it had been sterilized and taken to the laboratory. In a few instances, a meconium stool could not be obtained in this way, but a sample was obtained very soon after passing by taking up a sample from the stool on the end of the glass tube, care being taken to avoid, as much as possible, contamination from the skin or diaper. Cultures from these specimens showed nothing different from those obtained from the rectum.

1. A Gram stain from a direct smear of the material was made.

2. A large loopful of material was inoculated into a tube of whole milk previously heated to boiling or placed in the Arnold sterilizer for fifteen minutes. After inoculation, the tube was heated to 80 C. for twenty minutes and incubated. This test was for the determination of gas bacilli.

3. A loopful of feces was inoculated into a tube of melted gelatin for the determination of the presence of proteolytic bacteria.

4. Two blood-agar plates and two purple saccharose-liver plates were inoculated and incubated as follows:

A piece of glass tubing or rodding is drawn out in the flame about 3 inches (6.7 cm.) and sealed off in a tiny knob about 2 mm. in diameter. This serves as an inoculating instrument which is fairly flexible and the knob is less likely to cut the medium. A thoroughly hardened blood or sugar-agar plate is placed on the inoculating machine described by Varney.[5] A small amount of undiluted fecal material is obtained on the glass knob and the knob is allowed to touch the surface of the agar near the edge of the plate. As the plate is gently whirled, the glass needle is pulled to the center of the plate and removed. Care must be taken that there are no drops of condensation water on the surface of the agar. With practice, it is possible with one inoculation to make a spiral inoculating line so that 75 per cent or more of the plate contains discrete isolated colonies. One blood plate and one liver-agar plate were incubated in an anaerobic phosphorus jar[6] and the duplicates incubated aerobically.

Examination of Cultures.—In most cases the examination of cultures was made in forty-eight hours, except the reading of gelatin liquefaction. Stormy fermentation in milk, indicating the presence of gas bacilli, is usually evident in this interval of time. As will be seen by the results to be mentioned, most of the information recorded was derived from the anaerobic saccharose or lactose plates. If the plates are properly streaked, colonies of several kinds may be recognized with the aid of a low power objective. By forty-eight hours, the plates are usually a clear yellow, due to the acid produced by *B. bifidus* or other acid-producing colonies. After some practice with verification by Gram stains from individual colonies, the three organisms under consideration may be recognized. The colon-aerogenes colonies appear fairly large and pale—

5. Varney, P. L.: A New Spiral Streak Plate Method of Isolating Bacteria by Means of an Inoculating Machine, J. Infect. Dis. **41**:190 (Sept.) 1927.

6. Varney, P. L.: A Simple Method for Cultivating Anaerobes by Means of Phosphorus, J. Lab. & Clin. Med. **11**:1183 (Aug.) 1926.

indeed, in twenty-four hours when the yellow color is not entirely diffused some may appear bluish. Colonies of *M. ovalis* are solid yellow macroscopically and under the low power lens appear homogeneous and rather dark, while the colon colonies may show a wavy edge with faint concentric rings near the edge. The bifidus colonies in young cultures appear very small but are clearly seen with low power. In two or three days they are very distinct, as may be seen in figure 1. In order not to confuse them with *M. ovalis*, one may carefully break the colony with a fine inoculating wire while examining under low power, then, by adjust-

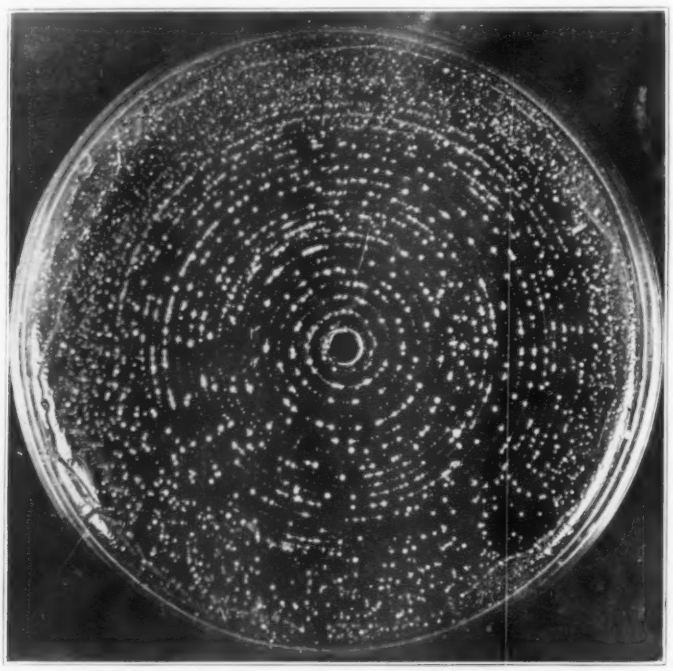

Fig. 1.—Thirty-six hour culture on an anaerobic saccharose liver-agar plate from undiluted feces of a breast-fed infant, aged 4 days. The larger colonies are *B. coli*, the smaller, *B. bifidus*. From such a plate a differential count may be made. By the aid of low power more colonies of bifidus are seen than appear to the naked eye.

ing the high dry lens, one can easily distinguish the irregular rods of the bifidus colonies or the diplococci in the broken edge of those of ovalis. The bifidus colonies have a granular appearance toward the center by which after practice they may be distinguished from the more solid appearing ovalis. As soon as one is sure of the identification of the colonies, the differential count may be made. A favorable part of the plate is selected and the low objective placed over one of the grooves

made by the inoculating instrument. When the plate is slowly revolved, the colonies come across the field and may be enumerated in the usual way until 100 or 200 colonies have been counted. A mechanical tally greatly facilitates counting, especially when one species greatly outnumbers the others. Blood plates were used chiefly as a check on the sugar-agar and to determine hemolysis; however, it was not practicable to attempt counts on them. They are especially useful in the cultures made during the period of meconium. The aerobic plates were of far less value than the anaerobic and were used only as a check.

The tables presented were compiled chiefly from the anaerobic saccharose plates, anaerobic blood plates and milk cultures. Often no counts could be made until the third day as the meconium stool showed such a variety of bacteria. As the conditions for growth in the intestine are no doubt of an anaerobic, or reduced oxygen, character the anaerobic plates would seem to be the best indicator of the proportion of viable bacteria in the feces. Colon bacilli are possibly inhibited to some extent

TABLE 1.—*Breast-Fed Infants During the First Week of Life; Infants Showing Presence of Gas Bacilli* *

Day	Number of Infants Tested	Per Cent
1 and 2	18	22
3	17	29
4	18	39
5	17	35
6	19	26

* Of a total of 20 normal infants, 11 (55 per cent) showed the presence of gas bacilli during the first week of life.

by this method, but, on the other hand, an aerobic method gives an exaggerated idea of their preponderance. The results obtained from anaerobic plates closely resemble the proportions observed on direct smears from the specimens plated.

Results.—In table 1 is indicated the occurrence of gas bacilli in the samples examined daily. It will be observed that the greatest number showed gas bacilli about the fourth day of life or about the time when *B. bifidus* was becoming predominant. In some cases, they were found to occur in considerable amount into the second week, some days after the predominance of *B. bifidus* was well established.

In tables 2 and 3, it will be seen that by the sixth day of life all of the normal infants examined presented easily demonstrable *B. bifidus*, the majority more than 90 per cent of the three organisms counted. The percentage figures are probably lower than would be the case in a larger number of samples, owing to the fact that for some reason three or four infants failed to show the usual flora until much later than the others. They showed no other abnormal condition as to temperature or digestion, so of course had to be included. The specimens from these infants were

done within a period of ten days, and these children were the first cared for in a new nursery. Whether this last factor had anything to do with a delay in the appearance of *B. bifidus* is only a matter of conjecture. No infants examined afterward exhibited this peculiarity.

Figure 2 shows a typical curve made in an actual case. It appears from this, as from the curves made in other cases, that the appearance of *B. bifidus* is sudden rather than gradual. In this particular case, the Gram stain on the direct material taken on the third day showed no gram-positive bacilli other than the gas bacilli and no colonies of *B. bifidus* appeared on the plates. On the fourth day, however, the smear showed little else than *B. bifidus*, and the corresponding plates gave 95 per cent bifidus colonies. In practically all of the examinations made

TABLE 2.—*Breast-Fed Infants During the First Week of Life; Infants Showing Occurrence of B. bifidus*

Day	Number of Infants Tested	Percentage Showing B. bifidus
1 and 2	18	22
3	17	65
4	18	88
5	17	88
6	19	100

TABLE 3.—*Proportion of Total Intestinal Flora Due to B. bifidus*

Day	Number of Infants Tested	20 per Cent or More, per Cent	50 per Cent or More, per Cent	90 per Cent or More, per Cent
1 and 2	18	11	5	0
3	17	29	11	6
4	18	72	66	22
5	17	88	70	59
6	19	100	100	63

after the establishment of the presence of *B. bifidus*, a few colonies of *B. coli* developed and intermittently those of *M. ovalis*.

The gelatin tubes gave some idea of the presence of proteolytic bacteria, but their identification was not usually attempted. About half of the specimens tested showed proteolytic bacteria which liquefied the gelatin in two or three days. Liquefactive power did not appear to be powerful; but, of course, the fact that all varieties of bacteria were growing together prevents any definite conclusions. On the whole, proteolysis appeared to decrease toward the end of the weekly period. This is to be expected as the meconium is a more favorable medium for such bacteria.

In the meconium, a considerable variety of bacteria appeared, remaining as long as the meconium character persisted. These organisms included hemolytic gram-positive cocci, methemoglobin-producing cocci,

large gram-positive cocci tending to grow in tetrads and a variety of spore-formers. Among the latter were *B. mesentericus,* identified by culture, and a curved rod with a terminal spore, possibly the bacillus known as the "Köpchen bacillus" of Escherich. As the bacteriology of the meconium is a study in itself, no attempt was made to identify these bacteria further. Specimens taken from entirely breast-fed children as old as 9 months showed the same flora as those of the typical infant, aged 6 or 7 days.

THE INTESTINAL FLORA OF ARTIFICIALLY FED INFANTS

Experimental Data.—The method used was essentially the same as that used on the material from normal children. From two to eleven specimens were taken from each of the infants, who ranged in age from

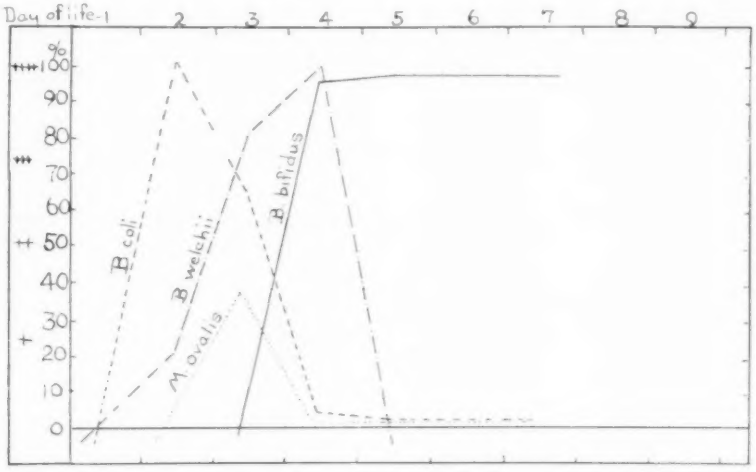

Fig. 2.—Relative proportions of the predominating intestinal bacteria of a normal breast-fed infant during the first week of life. The curves for *B. bifidus, B. coli* and *M. ovalis* are plotted according to the percentages obtained from the differential colony counts. The curve for *B. welchii* is based on the degree of milk fermentation indicated by ++++, +++, etc.

1 week to 9 months. Children on the following three types of feeding were selected:

1. Bacterially soured milk (probably by *Streptococcus lacticus*) obtained from a dairy.

2. Sterile whole milk.

3. Evaporated milk acidified with pure lactic acid. The evaporated milk was diluted with an equal volume of sterile water, and 0.5 per cent of lactic acid was added (Marriott[7]).

7. Marriott, M.: Preparation of Lactic Acid Milk Mixtures for Infant Feeding, J. A. M. A. **89**:862 (Sept. 10) 1927.

The proper carbohydrate requirement was supplied in the same manner in each of the formulas mentioned, by the addition of 9 per cent Karo syrup.[8] As far as possible, children who had been maintained for some time on the given diet and who showed, as nearly as could be determined, no abnormal temperature or intestinal disturbance were selected.

Results.—Table 4 gives the average percentage figures on the bacterial types under the three kinds of artificial feeding and breast-feeding. At the time the normal flora is established, the p_H of the stool of the

TABLE 4.—*Normal Artificially Fed Infants; Summary of Average Percentages of Colonies on Different Types of Feeding*

Type of Feeding	Case Number	Number of Samples	B. bifidus, per Cent	B. coli, per Cent	M. ovalis, per Cent
Bacterially soured milk	1	6	4	20	76
	2	2	8	91	1
	3	4	46	41	13
	4	11	15	18	67
Whole milk	1	8	28	10	62
	2	2	24	66	10
	3	3	27	3	70
	4	4	8	33	59
Evaporated milk with lactic acid	6	3	45	13	42
	7	3	0	10	90
	8	5	4.6	33	62.4
	9	6	0.4	39	60.6
	10	3	9	1	90
	11	2	3	1	96
Breast milk	12	2	98	1	1
	13	3	98	1	1
	14	3	95	3	2
	15	3	97	2	1
	16	2	88	2	10
	17	5	98	2	0
	18	5	97	2	1
	19	3	96	4	0
	20	2	86	14	0
	21	3	91	6	3
	22	3	86	14	0
	23	3	84	16	0
	24	2	81	2	17
	25	3	96	3	1
	26	2	87	5	8
	27	2	98	2	0
	28	1	75	18	7

normal breast-fed infant is almost invariably about p_H 5.2. In artificially fed infants, it ranged from p_H 5 to 8. The average for all types of feeding was p_H 7, although that for the lactic acid group was slightly more acid. It should be noted that the infants in cases 1, 2 and 4 were transferred to whole milk formula. The infant in case 1 was on this diet two weeks at the time of the last test, that in case 2 five days and that in case 4 one week. Owing to the fact that the whole milk diet was rarely used in the hospital, only one other suitable case (5) was used besides the three others described.

8. On a dry basis, the composition of the Karo syrup used was: dextrin, 48.5 per cent; maltose, 29.7 per cent; dextrose, 10 per cent, and saccharose and invert, 9.7 per cent.

Possibly in a longer period of time more change due to the whole milk might be found, but apparently no such striking change as that which takes place in changing from a diet of breast milk to one of whole milk occurred. Brown and Bosworth [3] mentioned that when a breast-fed infant is changed to a diet of whole milk for several days it may show the effects of this change even after being returned to breast-feeding for a long as four weeks. It is evident that there are slight, if any, differences demonstrable between the results of different kinds of artificial feeding, but that striking ones exist between the intestinal flora exhibited by any artificially fed infant and a breast-fed child. Moreover, the flora from the bottle-fed infant varies in character from day to day, while that of the child receiving its mother's milk shows bacterial proportions of striking constancy. To show that these variations occur daily and are not due so much to variations in different parts of the same

TABLE 5.—*Variation in Percentages of Colonies in One Individual (Case 4) in Different Samples* *

Date	Inoculation	B. bifidus	B. coli	M. ovalis
4/27/27	1	13	11	76
	2	12	6	82
	3	29	6	65
Average		18	8	74
4/30/27	1	2	27	71
	2	2	41	57
	3	1	26	73
Average		2	31	67
5/4/27	1	33	20	47
	2	56	17	27
	3	28	24	48
Average		39	20	41

* Three different inoculations were made from each sample.

specimen, table 5 is shown. This record is taken from that of case 4, previously mentioned. It will be seen that the results 1, 2 and 3, referring each to a separate inoculum from the same specimen, are fairly similar, whereas their average results may differ from the average of three inocula from another specimen to a marked degree. Such variations from day to day might be due to a variation in the length of time that the fecal material has remained in the intestine, or, in other words, such material may be representative of different portions of the intestinal tract. It would appear, then, that intestinal contents in the breast-fed child are more homogeneous throughout than in the artificially fed child. Such interpretations are merely conjectural.

The results of examination of bacteria other than the three main types in these cases are similar to those of the bacteria of the meconium mentioned in the early part of this paper. There was the occurrence of spirochetes, hemolytic cocci, other types of cocci not identified and

spore-formers. It is interesting to note that *B. acidophilus* was identified in only a few instances, although the medium used was entirely favorable for this organism.

In view of the fact that some authors (Brown and Bosworth [8]) have tried to attribute the source of infection of the intestinal tract with *B. bifidus* to breast milk or even to the skin about the nipple, it is of interest to mention that in case 4 previously described no breast-feeding was given after the second day, and in case 6 the infant was on a diet of lactic acid milk from birth. As the lactic acid milk was prepared from presumably sterile evaporated milk, it seems as if one would have to look elsewhere than to the milk for the source of this puzzling organism. The

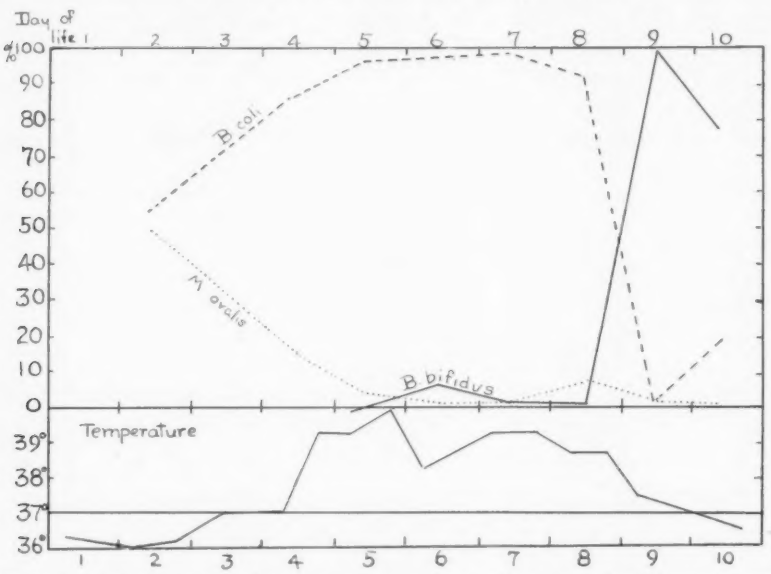

Fig. 3.—Relative proportions of the predominating intestinal bacteria of a breast-fed infant who developed fever and slight intestinal disturbance during the first ten days of life. No gas bacilli were present in this infant.

overwhelming preponderance of this organism in the intestine of the breast-fed infant has been attributed to the higher hydrogen ion concentration of the infant's stool. While this fact undoubtedly plays a rôle in bringing about the conditions mentioned, it does not seem to be entirely adequate and the subject of the overgrowth of *B. bifidus* is discussed more fully in work to be published.[9]

The method described might be applied to the examination of children with pathologic conditions, but would be more successful when

9. Upton, M. F.: The Effect of Filtrates of Certain Intestinal Microbes upon Bacterial Growth: Its Relation to Organic Acid Production, J. Bact., to be published.

applied to wholly breast-fed infants. Figure 3 shows a curve prepared similarly to that of the normal child. This infant, however, while breast-fed, developed a fever which persisted until the ninth day. While it had symptoms somewhat similar to severe "inanition fever," there was in addition a slight diarrhea. It is interesting to note the establishment of the normal flora at practically the same time the temperature became normal. While too much emphasis cannot be placed on one case, it would seem that there might be some connection between an abnormal condition in the breast-fed child and the proportion of bacterial types. However, in artificially fed infants such an examination would not be so reliable as they seem to have no "normal intestinal flora."

In ordinary routine cases, of course, there are many instances of mixed feeding, especially among nursery infants to whom supplementary artificial feedings are given. An effort was made to derive the data for this paper from infants fed exclusively on the diet indicated. However, a few of the breast-fed children had occasional supplementary feedings, and some of the infants fed the lactic acid milk were given breast milk. In general, it might be said that when the majority of feedings are from breast milk, occasional supplementary artificial feedings have no demonstrable effect on the intestinal flora, and when an artificial diet is in preponderance, occasional breast-feedings appear not to influence the bacterial observations.

SUMMARY AND CONCLUSIONS

An attempt was made to determine by daily anaerobic cultural methods the relative proportion of the organisms most commonly present in the feces of the normal nursling during the first week of life. The organisms most carefully studied were the gas bacillus and bacteria of the colon, *M. ovalis* and *B. bifidus* groups. As it was found that in breast-fed infants at the end of five or six days a constant "normal flora" was established, the results obtained at the end of this time were used as a basis of comparison for tests on infants under 9 months of age nourished on three types of artificial feeding, i. e., bacterially soured milk, sterile whole milk and evaporated milk acidified with lactic acid.

The following conclusions are drawn from this study:

1. As long as the meconium character of the stool persists, the flora exhibits a variety of organisms, most of which disappear under breast-feeding as *B. bifidus* becomes predominant.

2. *B. bifidus* may appear in the feces as early as the second day of life and becomes predominant by the fourth or fifth day in the breast-fed infant. The sudden predominance of this organism would indicate a possible relation to the establishment of the milk diet.

3. Gas bacilli occur in about 50 per cent of cases about the second day, but tend to disappear as *B. bifidus* is established.

4. In an artificially fed child, the intestinal flora resembles that of the breast-fed infant, aged 2 or 3 days, when the meconium flora still persists and only a few *B. bifidus* organisms have appeared. It exhibits great variety in contrast to the monotony of that of the breast-fed infant. Different specimens from the same child vary as much as those from different children.

5. There appears to be little or no difference between the intestinal flora of infants under the three different types of artificial feeding investigated.

Case Reports

KÖHLER'S DISEASE

I. A CAUSE OF LIMP IN CHILDREN *

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CHICAGO

CASE 1.—A girl, 5 years of age, was brought to the Mayo Clinic because she limped. She had had no trouble with her extremities until she was 4½ years old. Then, without apparent cause, a transitory swelling with redness appeared on the dorsum of the right foot. This was said to have lasted only twelve hours One month after the appearance of these signs of inflammation, the child began to limp. She was taken to a physician, who made an examination without finding any explanation of the limp. The parents were reassured. The limp persisted, however, and the child was brought for further examination

On examination, the inner side of the dorsum of the right foot was tender. There was no redness, swelling or local heat. The Pirquet reaction was definitely positive. The examination of the chest, both clinical and roentgenologic, revealed negative results. The leukocyte count was 8,000. The Wassermann reaction of the blood was negative. A roentgenogram of the right foot showed the characteristic lesion of Köhler's disease of the navicular (figs. 1 and 2).

An orthopedic shoe with an adduction correction was prescribed for the foot, and the symptoms were relieved.

CASE 2.—A girl, 3 years of age, was brought for examination because she limped. When she was about 2 years of age, the child's parents had noticed that she was becoming knock-kneed. At 2½ years of age she began to limp and to walk on the outside of her right foot. Two weeks previous to the time of examination, a swelling appeared on the dorsum of the inner side of the foot. The limp grew worse until finally the child refused to walk.

Examination revealed an obese child, tall for her age, but bright. There were signs of rickets. She had bilateral knock-knee and flat feet. The condition was worse on the left than on the right. A slight swelling was present over the navicular region of the left foot. This area was tender to pressure.

The Pirquet reaction was negative. The leukocyte count was 9,200 with a normal differential count. Roentgenograms showed the hip, knee and ankle to be normal. The left foot showed a typical lesion in the navicular (figs. 3 and 4). Orthopedic heels with supination of heels and soles gave relief.

A third case was seen at the Research and Educational Hospital. Again the diagnosis had been missed previously. The results of the examination at the hospital led to the making of an x-ray photograph of the right foot, and the characteristic lesion of the navicular was revealed.

SUMMARY OF OBSERVATIONS ON RECORD

The obscurity of the disorder in each of the cases baffled the physicians. In many other instances, the condition no doubt remains undiagnosed. It may occur more frequently than is commonly thought.

* Submitted for publication, Dec. 18, 1928.

Lameness in a child demands an exact diagnosis. Incipient tuberculosis and infectious arthritis no longer remain hidden under the cloak of "growing pains." Less common lesions like Köhler's disease demand a diagnosis, although self-limiting treatment relieves the symptoms and shortens the course. I wish to emphasize the importance of diagnosis in lameness of children and to shed more light on one of the obscurer causes, namely, Köhler's disease of the navicular. Sufficient is known of the disease to make for clear definition, history, symptoms, diagnosis and prognosis. Repeated descriptions of the morbid anatomy coincide. Only the etiology offers difficulty. Of the several theories advanced, one

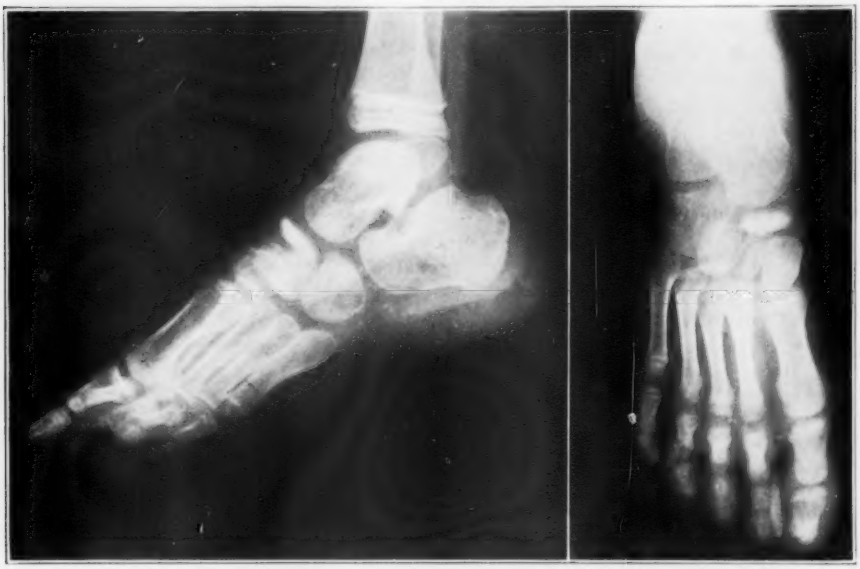

Figure 1 Figure 2

Fig. 1 (case 1).—Characteristic changes of Köhler's disease of the navicular (right foot).

Fig. 2 (case 1).—The greatly increased density of the navicular may be noted, with irregular distribution of calcium.

which occurred to me seems to explain the known facts most satisfactorily.

Köhler's disease of the tarsal scaphoid is a self-limiting disease occurring in children. There is usually local tenderness, and the patient limps. The characteristic lesion shows itself in the roentgenogram by an abnormally dense shadow shortened anteroposteriorly.

The disease was first described by Albert Köhler in 1908. It is not to be confused with the disease of the head of the second metatarsal which also bears Köhler's name. Since the original description, a rather

extensive literature has accumulated about the subject, which includes the report of at least 104 cases (Muro). On the whole, little of significance has been added to the clinical and roentgenologic description. A description of the aforementioned observations has given a more exact knowledge of the morbid anatomy. Most of the discussion has been concerned with the possible causes of the disease.

The disease most commonly occurs in children between the ages of 5 and 8 years. In case 2, the child was 2½ years old, the youngest

Figure 3 Figure 4

Fig. 3 (case 2).—A typical lesion in the navicular, due to Köhler's disease in a child, aged 3 years. The uneven distribution of calcium may be noted.

Fig. 4 (case 2).—The decrease in size of the navicular with increased density may be seen.

patient on record. The youngest previously was a child 4 years old (Dwight), and the oldest was 10 years old (Bachman). Usually, as in the three cases that I have described, one foot only is involved, although eight instances of bilateral involvement have been recorded. Limp is the most constant symptom. The region over the navicular is sensitive

to pressure. Discomfort exists only over the medial longitudinal arch. Walking causes pain in this region. The symptoms are few because the diseased scaphoid is splinted by the firm arch of lateral bones. Only in walking in which the springlike elasticity of the medial arch comes into play is the bone in demand. At times, the pain also occurs at night. Sometimes, swelling and redness may be observed over the navicular. At times, as in the first case, a brief period of acute symptoms is followed by a period of remission, and then the usual symptoms manifest themselves.

The changes as seen in the roentgenogram are characteristic (figs. 1, 2, 3 and 4). In the first place, the navicular alone is involved. It projects above the normal contour of the foot. In the dorsal-ventral direction the size is greater, but from front to back it is much shorter. The change in the bone is fourfold: its size is reduced to one half the normal size; its form is irregular with a ragged contour; its architecture represents a conglomeration of cortex and substantia spongiosa, while its density has been doubled or even quadrupled. An uneven distribution of the calcium gives a spotted appearance to the picture.

The history of a limp in a child with localization at the tarsal region is a valuable guide, but a definite diagnosis is dependent on a roentgenogram of the foot. Children suffering from this disease are frequently treated for foot strain, flatfoot, a contusion or arthritis, and occasionally, if an x-ray picture has been taken, fracture, osteomyelitis or tuberculosis of the navicular. No history of trauma sufficient to cause a fracture precedes the clinical manifestations. In tuberculosis and osteomyelitis, the lesion is not limited to the one bone as in Köhler's disease. There is at least some secondary atrophy in the other bones of the foot. With a limp overshadowing the other symptoms, roentgenograms of the hip and knee are vainly searched for an explanation of the trouble. If the search is carried no further, the disease goes on through many months to a spontaneous cure without diagnosis.

The prognosis in all cases described was good. The length of time required to obtain a complete recovery averages about two and one-half years. Relief from symptoms can be obtained almost at once with treatment. The final result is a complete restoration of the navicular in size, contour, architecture and calcium content.

Descriptions of three specimens obtained at operation have been given in the literature. The observations in each case coincided closely, although the interpretation of them varied. A central zone of necrotic tissue was present in the scaphoid bone. The rest of the bone was fairly well preserved, except for small areas of erosion. Microscopically, the specimen consisted of fragments of rather cellular cartilage. The centers

of ossification comprised osteoid septums of fibrous tissue and cartilage with normal marrow in the interstices. There was an imperfect, uneven deposition of lime salts throughout.

ETIOLOGY

The suggested etiology of this disease of the navicular has ranged from endocrines unbalanced to osteomyelitis, including syphilis, a congenital anomaly, a compression fracture and tuberculosis. Since the description of the morbid anatomy, two theories have remained for consideration: (1) that of inflammation, (2) that of a nutritional disturbance.

The local swelling, redness and tenderness over the scaphoid argue for the theory that the condition is inflammatory. The increased density is regarded as a defensive mechanism (Lucene and Mouchet), and is comparable to the sclerosing type of osteitis. The low virulence of the infection accounts for the absence of fever and leukocytosis. To those who see in Perthes' disease of the hip an inflammatory process, the similarity of the two diseases is an argument in favor of the theory that the condition is inflammatory (Muro and Kidner). Against this theory is the frequent absence of signs of inflammation. The period of inflammation when it does appear is brief. There is no explanation of the remission or of the peculiar localization, nor are the observations of the pathologist in accord with an inflammatory lesion.

The theory that a nutritional disturbance is responsible for the changes in the scaphoid was first proposed by Preiser. It has since been defended by Koritzenski in 1919, and Caffier in 1923. Preiser concluded that the primary injury occurs to the naviculolunate ligament, which bears the chief vessels of nutrition of the navicular. Interference with the blood supply leads to a necrosis and, with application of the body weight, to a compression fracture. The development of the secondary vessels on the volar surface explains the rebuilding of the bone to normal. This interpretation of the disease agrees closely with that sometimes advanced for Kümmel's disease of the spine and Kienboch's disease of the lunare. As is the case in both these diseases, trauma is the most common factor of etiology to appear in the history (Barclay and Moffet). This trauma is never severe enough to be the direct and only cause of what the x-rays show to be an extensive structural change. The trauma, like the appearance of the signs of acute inflammation, occurs from several days to several months previous to the onset of the limp. It is believed that the trauma cuts off the blood supply and sets up a nutritional disturbance. The changes are not those of a necrosis due to cutting of the nutrient artery. The mechanism needs further explanation.

The term nutritional disturbance is vague. The disease is in the nature of a disturbance in the deposit of calcium of the navicular. The laboratory examination of specimens showed comparatively normal bones except for the peculiar distribution of the calcium. We know that the calcium content of the body and the blood remains constant. The percentage of calcium in normal bones holds a certain level. It is believed that the bones act as a reservoir for the calcium. The deposition and removal of calcium in a bone are regulated by the vasomotor supply of the bone. Any injury or infection that sets up a vasomotor disturbance eventually gives rise to a change of the calcium content in the bone. This was seen to be the case in acute atrophy of bone. Calcium is not destroyed, but when taken from one area it is deposited in another. In Köhler's disease of the scaphoid, the vasomotor disturbance set up by a slight trauma after an interval causes the calcium to be removed from the central area of the navicular and deposited irregularly at the periphery. The weakened central structure gives way under pressure and gives rise to the typical lesion as seen by x-rays. When the cause of the vasomotor disturbance is removed, recovery of the normal distribution of calcium slowly takes place. There is much unknown with regard to the distribution of calcium, which when discovered may shed more light on these obscure and but little understood disturbances.

TREATMENT

The treatment based on the morbid anatomy consists in protection. In the acute phase, immobilization is advocated with a plaster of Paris cast for from three to ten weeks. Alternating baths, as well as heat and massage, seem to be of benefit. In the later stage, as in the cases described, sufficient protection can be obtained by throwing the body weight to the outer side of the foot. This is easily done by means of orthopedic heels and the supination of both heel and sole.

HYPOSUPRARENALISM *

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MILWAUKEE

This case is presented because of its unusual features. No reference is made to hyposuprarenalism in any detail in the pediatric textbooks or in the literature. It is apparent that this syndrome is extremely rare.

REPORT OF CASE

W. J., a boy, aged 13 years, was admitted to the hospital on Oct. 6, 1928, in what appeared to be a state of acute acid intoxication.

The father's sister died at the age of 43 and his mother, at the age of 68, both of tuberculosis. The father's brother is said to have had a "tan skin" for years. There were no other abnormal features in the family history.

The patient weighed 7 pounds (3.2 Kg.) at birth, following instrumental delivery, and appeared to be a normal infant. He was breast-fed for over twelve months, showed a normal development and walked and talked at the age of 1 year. He had a mild case of pertussis at the age of 3 years with no complications or sequelae. He had moderately severe measles at the age of 4 years and a mild case of scarlet fever at the age of 7; no complications or sequelae occurred with either illness. There was no history of an accident or injury. A tonsillectomy and adenoidectomy was performed at the age of 10 years with no unusual reaction.

The father and mother stated that the boy had always been thin and that his appetite had never been good. He preferred sour foods to sweet and would never eat much at one time. The boy had always seemed weak; he tired easily and was extremely temperamental and emotional. He could not play baseball or football with the other children, but would sit on the side and watch. When he attempted to run, he would go but a few yards and stop and sit down, complaining of palpitation. His hands always perspired freely. The father stated that the boy had always had a dark skin like that of his uncle.

One year before the present illness the father took the boy out hunting to get him out in the open. The patient collapsed before he had walked half a mile. The father stated that the boy became dyspneic, that his heart beat hard and rapidly, and that he had to be carried home. He seemed never to have recovered from this exertion.

Seven years before the present illness, the boy had a condition that was diagnosed an acute inflammation of the bowels. In this illness, which lasted about three weeks, the temperature ranged from 95 to 107 F.; the patient had abdominal pain, nausea, vomiting, anorexia and constipation. Ever since then, there had been a recurrence of abdominal pain, anorexia, nausea and vomiting every three or four months.

The father stated that physicians who saw the boy in these attacks made the diagnosis of recurring vomiting and acidosis. On several occasions they found that his blood sugar was low. He was usually treated by the administration of

* Submitted for publication, Jan. 14, 1929.
* Read before the Chicago Pediatric Society, Jan. 15, 1929.

dextrose and soda bicarbonate given by mouth, by rectum and intravenously. On one occasion, two years before the present illness, the father thought for ten or fifteen minutes that the boy was dead.

The present illness began with a cold, three weeks before admission to the hospital. This was followed by anorexia, abdominal pain, nausea and vomiting which occurred with or without ingestion of liquids or foods. When the patient was admitted, examination revealed a poorly developed, poorly nourished,

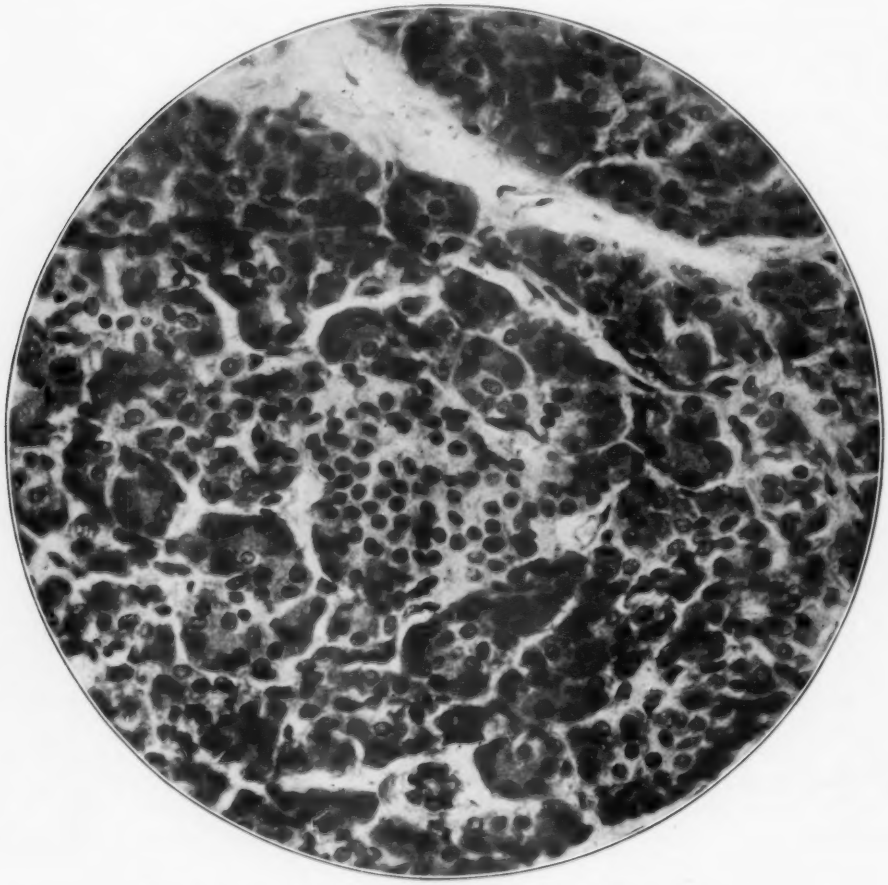

Fig. 1.—The pancreas, showing normal islet; high power.

hyposthenic boy with a bronze skin. There was marked dehydration; the skin was dry and inelastic. The eyes were prominent. The conjunctivae were suffused. The cheeks were sunken. The mouth was dry, and there was a strong odor of acetone in the breath. The chest was clear. The heart rate was 120 per minute; there were no murmurs or enlargement. No abnormal condition was observed in the lungs. The abdomen was scaphoid; no abnormal masses were felt and there was no tenderness. The palms of the hands perspired freely. The reflexes were exaggerated, except the patellar which were difficult to elicit. The temperature was 100 F.

The blood count showed: erythrocytes, 4,650,000; hemoglobin, 72 per cent (Dare); leukocytes, 16,200; neutrophils, 73.5 per cent; small lymphocytes, 22 per cent, and large lymphocytes, 4.5 per cent. The blood sugar was 63.7 mg. Examination of the urine revealed: specific gravity, 1.020; reaction, acid; albumin, 0; sugar, 0; acetone test, 4 +; diacetic acid, 0, and microscopic observations, 0. The carbon dioxide combining power of the plasma was 28.7 per cent by volume. The

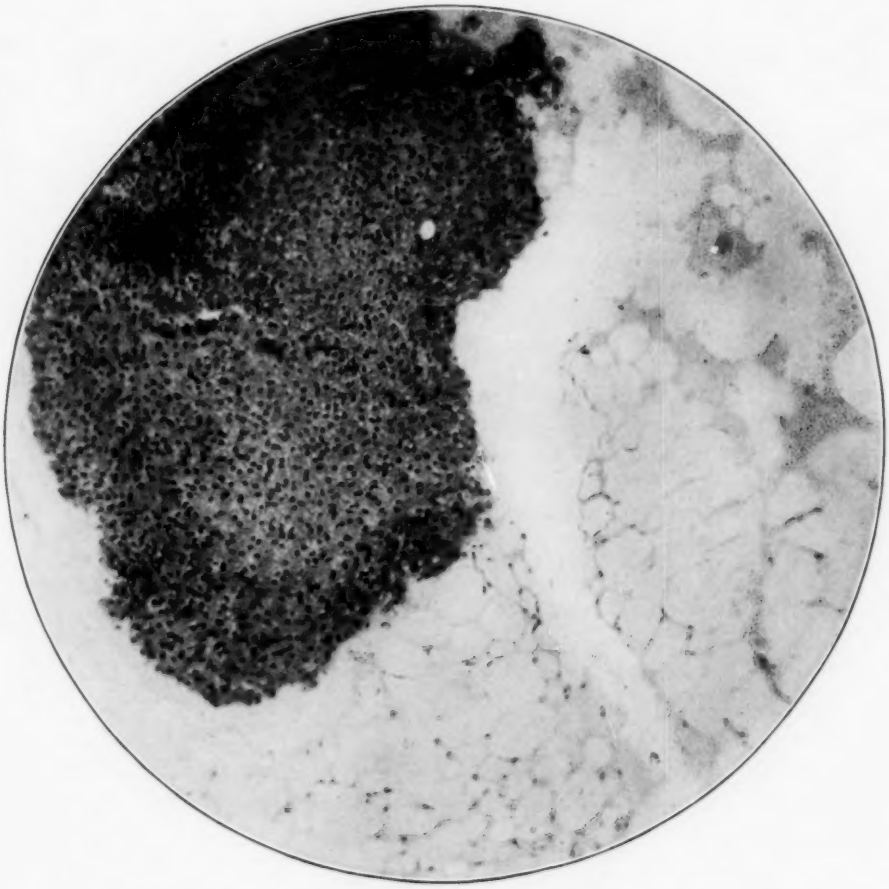

Fig. 2.—An island of suprarenal tissue surrounded by fat; low power.

blood pressure was 84 systolic and 44 diastolic. The Wassermann and microprecipitation tests gave negative results.

The patient was put to bed and kept warm. Dextrose and insulin were given intravenously. Solutions of dextrose and sodium bicarbonate were given by proctoclysis. Treatment was started at 4 p. m. At 9 a. m. on the following day, the blood sugar was raised to 117 mg., and there was only a trace of acetone in the urine. The patient was given 1 cc. of epinephrine subcutaneously. There was no change in the pulse rate, blood pressure or the patient's condition. The tempera-

ture gradually rose to 106 F. and the pulse increased to 150 at 6:20 p. m., when the patient died.

Postmortem examination was limited to the abdomen. The appendix was found to be thickened and the mucosa infiltrated with leukocytes, showing a chronic appendicitis. The liver was enlarged, pale and yellowish. Section showed marked cloudy swelling with areas of fatty degeneration. The spleen was enlarged and purplish; on section it showed marked congestion. The kidneys were

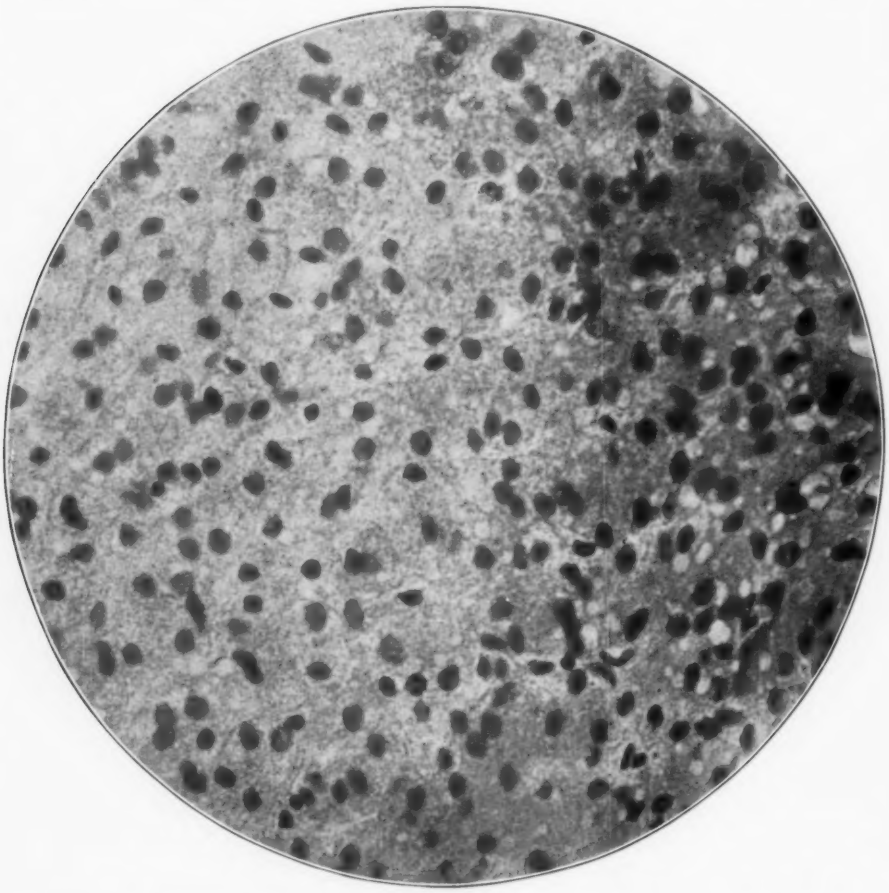

Fig. 3.—Fascicular and reticular suprarenal tissue of area shown in figure 2; high power.

pale and yellow; on section they showed marked cloudy swelling. Search for the suprarenal glands revealed a mass of fatty tissue on each upper pole of the kidneys. Sections through this fat demonstrated in one area a small island of suprarenal tissue which showed cloudy swelling with areas of beginning fatty degeneration. Sections through other portions of the fatty tissue showed suprarenal tissue in various stages of fatty degeneration. The glands were almost entirely destroyed by fatty degeneration (figs. 2, 3 and 4).

COMMENT

The foregoing case is presented as a possible instance of hyposuprarenalism. The outstanding features were: the history of tuberculosis and possibly Addison's disease in the father's family, and, in the patient, the history of weakness, lassitude, easy fatigability, vasomotor instability, gastro-intestinal irritability, lowered resistance to

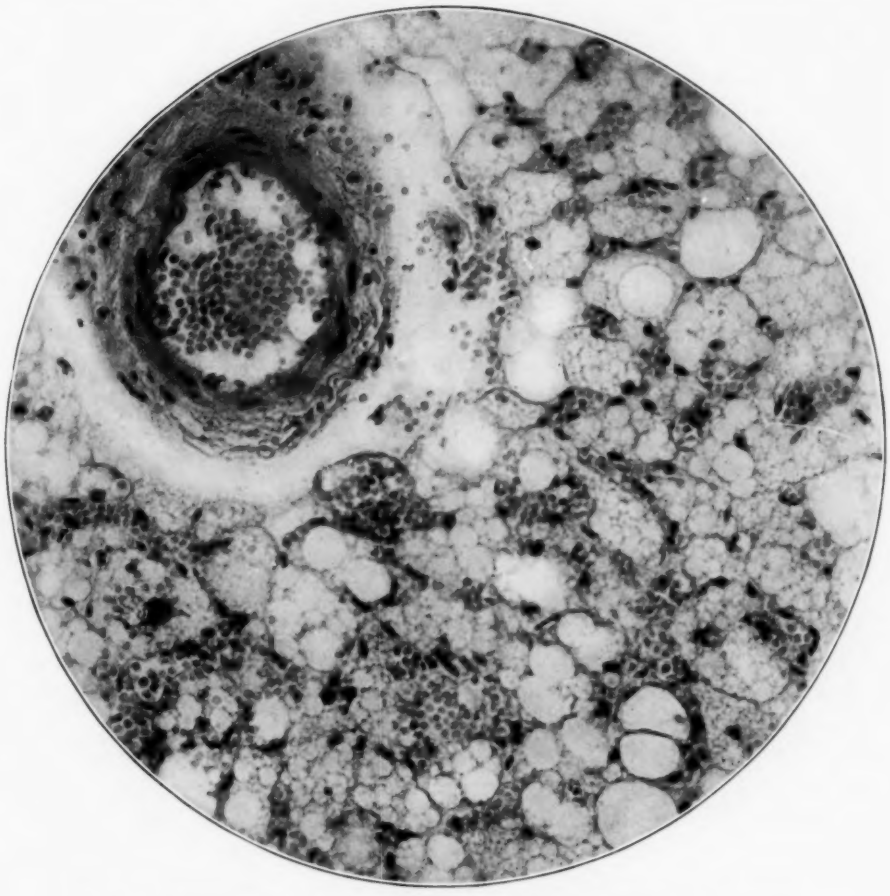

Fig. 4.—Suprarenal tissue, showing fatty degeneration; high power.

infection, repeated attacks of acidosis, bronze skin, low blood pressure, sweating of the hands, hypoglycemia, acid intoxication and ketosis.

Koehler [1] described sixty-three cases of hyposuprarenalism in adults. These patients were suffering from a deficiency in the energy

1. Koehler, A. E.: Differential Diagnosis Between Hyperthyroidism and Hyposuprarenalism, J. A. M. A. **91**:1457 (Nov. 10) 1928.

metabolism; consequently, they experienced languor, fatigability, asthenia, often somnolence, or restlessness and nervous instability. Koehler stated that the onset was usually with or following infectious or toxic states or the result of exhaustion. The onset was sudden but there might be temporary periods of remission. Rest usually was associated with improvement, while overexertion aggravated the symptoms. The patients were usually underweight; there was vasomotor instability and the hands and feet perspired freely. The blood pressure was low. There was a marked instability of the body temperature.

Goldzieher [2] and Hartman [3] have demonstrated that the suprarenal gland contains two distinct hormones, one the well known suprarenalin, a product obtained from the medulla, the other, "interrenin" or "cortin," which has been obtained by these investigators from cortical extracts. It has been possible to increase the length of lives of suprarenalectomized cats from five or six days to an average of twenty-seven days or longer by an injection twice daily with cortin.[3] The symptoms which appeared in the animals after ablation of the suprarenal gland were a lowered resistance to cold and infections and an increased fatigability. Also, any strain on the digestive functions produced the symptoms of suprarenal insufficiency.

Yonkman [4] pointed out that bilateral suprarenalectomy in rats was followed by acid intoxication.

Koehler [1] found that his patients had no reaction following the injection of suprarenalin. He stated, however, that cortical substance, prepared by fractionation from fresh glands, gave great relief to a large number of patients with suprarenal insufficiency, and that it was keeping completely suprarenalectomized dogs alive and well.

There was little to be found in the literature about hyposuprarenalism in children. Koehler stated that in his series there was one girl, aged 12, and a boy, aged 10.[5]

Goldzieher and Greenwald [6] cited two cases of hemorrhage of the suprarenal gland in the new-born infant with symptoms limited, more or less, to hyperpyrexia, dyspnea and a yellowish pallor. The authors apparently diagnosed suprarenal hemorrhage in one case on these symptoms alone. In fact, they stated that "in the presence of a fever of unknown origin and an increased respiratory rate which is out of proportion to the rise in temperature, together with negative chest observa-

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2. Goldzieher, M. K.: Klin. Wchnschr. **7**:1124 (June 10) 1928.

3. Hartman, F. A.; Brownell, L. A.; Hartman, W. E.; Dean, G. A., and MacArthur, C. G.: Am. J. Physiol. **86**:353 (Sept.) 1928.

4. Yonkman, F. F.: Am. J. Physiol. **86**:471 (Sept.) 1928.

5. Koehler, A. E.: Personal communication.

6. Goldzieher and Greenwald: Hemorrhage of Suprarenals in New-Born Infants, Am. J. Dis. Child. **35**:324 (Aug.) 1928.

tions, hemorrhage into the suprarenals should at least be suspected. The presence of a yellowish pallor with cyanosis of the lips and fingertips may be regarded as confirmatory evidence (in new-born infants)." One of the authors referred to this paper as "reporting a case of acute suprarenal insufficiency which was successfully treated with cortical hormone." [6] It is evident that the designation "suprarenal insufficiency" was used loosely.

PULMONARY EMBOLISM IN INFANCY*

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AND
BYRON K. RUST, M.D.
CHICAGO

A case of pulmonary embolism and thrombosis is reported because of the rarity of the condition in infancy. A review of the literature reveals the following cases with an age range of from 1 to 4½ years. Wessen [1] reported a case of fatal pulmonary embolism in a boy, aged 4 years, following resection of the rib in "pleural" pneumonia. Lutz [2] reported observations made at autopsy in twenty-two cases of measles; six of the patients had extensive pulmonary thrombosis and two a portal thrombosis. Three of the eight patients had an associated purulent otitis media and five a sinus thrombosis. Péhu and Horand [3] stated that after embolic causes, the most common etiologic factor of pulmonary thrombosis in children is otitis media. Guillemot,[4] in speaking of the otogenous origin of pulmonary gangrene, stated that otologists consider pulmonary metastases frequent following a thrombophlebitis of the lateral sinus and rare following a sinus thrombosis.

REPORT OF A CASE

History.—A white girl, one of twins, aged 11 months, was admitted to the infant ward of the Presbyterian Hospital on Aug. 17, 1928, because of a severe diarrhea of two weeks' duration. The stools were watery, putrid, mixed with mucus and curd, and numbered from six to twelve a day. Vomiting occurred several times. There had been an undetermined fever for two days previous to admission. In spite of a careful dietary regimen outlined in the feeding clinic a week before entrance, a loss of 1½ pounds (0.7 Kg.) occurred with no abatement in the number of stools. The birth was normal, and the feeding consisted of breast milk alone for five months and mixed and artificial feeding as outlined in the Infant Welfare Station up to the time of entrance.

At the age of 1 month, an infection of the upper respiratory tract was present, and on routine cultures diphtheria bacillus was found. A diagnosis of diphtheria carrier was made because of the mildness of the attack. (Cultures made on admission were negative.) An uncomplicated chickenpox was present at the age of 8 months, but since then the infant had developed normally. In the family

* Submitted for publication, Dec. 22, 1928.

* From the Pediatric Service of the Presbyterian Hospital.

1. Wessen, N.: Tötliche Lungenembolie bei einem 4-jahrigen Kinde nach Rippenresektion bei Pleuroempyem, Acta. chir. Scandinav. **54**:123, 1922.

2. Lutz: Ueber Thrombenbildung bei Masern, mit besonderer Beteiligung der Lungenarterien, Berl. klin. Wchnschr. **50**:1566 (Aug. 25) 1913.

3. Péhu and Horand: Lyon méd. **104**:1307, 1905.

4. Guillemot, L.: Bull Soc. de pédiat. de Paris, **8**:229, 1906.

history we found that the four children, aged 6, 5, 3 and 2 years, respectively, had severe diarrhea previous to the onset of symptoms in the patient, while the twin sister developed a diarrhea the day following the onset of symptoms. The twin sister was admitted to the hospital on the day of the death of our patient and died two days later; however, the observations were essentially negative.

Examination.—At the time of admission the examination revealed a moderately well nourished, white child, approximately 11 months old, weighing 14¾ pounds (6.7 Kg.). The rectal temperature was 102 F., the pulse rate 150 and the respirations 26. The skin was fair, smooth and dry, and the tissue turgor was poor. The infant was listless during the examination and did not seem to be in pain. Otoscopic examination revealed a normal left and a slightly hyperemic right membrane. The pillars and pharynx were definitely injected, and there was an acetone breath. Cervical and general adenopathy were absent. The heart and lungs revealed no abnormal conditions. The abdomen was lax and free from tenderness and masses; the liver and spleen were not enlarged. The buttocks were definitely excoriated.

The examination of the blood showed: hemoglobin, 49 per cent; 5,980,000 erythrocytes; 15,900 leukocytes, with 30 per cent polymorphonuclear, 62 per cent small mononuclear and 8 per cent large mononuclear leukocytes. Urinalysis showed a trace of albumin and occasional white blood cells. Cultures of the stools on blood agar and endomediums and fermentation tests revealed *Bacillus coli-communis* and *Bacillus proteus.*

Course.—For three days there was a gradual loss of ground, and on the morning of the fourth day, a radical change with a state of severe shock took place. There was a slight decrease in resonance in the right midaxillary line with a slight decrease in the transmission of breath sounds in the same region. Roentgen study at this time showed nothing abnormal. Five hours later the infant vomited a large amount of mucus and blood and died two hours later. Antemortem examination revealed bronchovesicular breathing in the lower part of the chest on the left side with decreased resonance in both bases.

There had been no intravenous injections, as no therapy other than dietetic and hypodermic stimulation with caffeine was employed.

Autopsy was performed by Dr. Carl Apfelbach, resident pathologist, and his observations were as follows:

The anatomic diagnosis was: extensive pulmonary embolism; clotting which distended the chambers of the right side of the heart; acute hyperplasia of the mesenteric glands; peptic erosions of the lining of the stomach; free blood in the lumen of the stomach; general anemia and marked fatty changes of the liver.

Gross Alterations.—The body weighed 12 pounds (5.4 Kg.), and was 72 cm. long. Rigor mortis was beginning in the extremities, and the body was still warm. The outside of the body was bloodless.

The abdominal organs also were bloodless. The wall of the colon was white and opaque. The small bowel was dilated, and the colon was collapsed. There was a kink in the midportion of the transverse part of the colon, 10 cm. long, extending down toward the symphysis. The mesentery between the limbs was only 1 cm. wide.

The lungs did not collapse when the chest was opened; they were pale gray. The chambers of the right side of the heart were filled with loosely clotted blood, which was almost black. The lungs were crepitant throughout. The left branch of the pulmonary artery was occluded by three clots in its lumen, each about 2 mm. in diameter. These clots were formed in vessels elsewhere

in the body because they were molded to a different lumen. One of them had a branch. In the surfaces, there were linear markings of Zahn. The largest part of each clot was purple, but there were portions that were mottled gray and purple. There were similar clots in the second divisions of the pulmonary artery and in some of the branches extending to the periphery, the latter being

A cross-section of the embolus, which shows a heavy platelet network. Lining the spaces are polymorphonuclear and large mononuclear cells in equal proportion; the remainder of the spaces is filled with erythrocytes.

purple and molded to fit the lumina in which they obtained. The pulmonary artery to the lower lobe of the right lung was also occluded by a clot similar to those in the left main branch, and distal to this clot the branches were filled

by purple molded clots. The scant blood on the surfaces, made when the lungs were sectioned, was bright red, whereas elsewhere the blood was dark red to black.

The lumen of the left ventricle was filled with a purple elastic clot with a network in the trabeculae carnae which held the clot to the wall. The apex of the left ventricle was rounded, and surfaces made when the wall was sectional were light gray to light gray-red.

There was little fluid in the lumen of the small and large bowel, which was light gray, opaque and watery. The lining of the large bowel was slightly thickened and light gray, mottled with light red engorged capillaries. The lymphoid tissue in the large and small bowel was sparse. The lining of the ileum was similar to that of the colon.

In the lumen of the stomach there were multiple (about 100) pinpoint red dots; under a hand lens some of them bled when the mucous membrane was manipulated.

The liver was yellowish brown throughout.

Unfortunately, the large vessels of the extremities could not be examined, but there was no clinical evidence of thrombosis.

Histology.—In sections of one of the emboli from the left pulmonary artery, fixed in Zenker's solution, embedded in paraffin and stained with hematoxylin and eosin, one end was made up chiefly of a heavy platelet network. Lining the spaces were polymorphonuclear and large mononuclear cells in equal proportion, and the remainder of the spaces was filled with erythrocytes. The largest part of each clot, however, was made up predominantly of erythrocytes, fibrin and leukocytes, the latter in proportion as they usually are in the blood stream.

In sections of the small and large bowel, there were no infiltrations of leukocytes. The glandular elements were intact, and except for an unusually large amount of lymphoid tissue in the ileum, there were no noteworthy microscopic alterations.

In sections of the pancreas, trachea, fallopian tubes, suprarenal glands, kidneys, uterus, striated muscle of the abdominal wall, ovaries and appendix vermiformis there were no noteworthy microscopic alterations.

In sections of the liver, there were vacuoles in many of the hepatic cells surrounding the central veins. The nuclei of all of the hepatic cells, however, stained without any noteworthy change. There was little lymphoid tissue in the periportal spaces.

The striations of the myocardial fibrils were distinct. The nuclei were all about the same shape and the chromatin stained equally well throughout. There were no cellular infiltrations.

In sections of the spleen, the vascular spaces were narrow and the splenic pulp was abundant, the predominating cells being round and reticular cells. The malpighian corpuscles were numerous and small.

In sections of a mesenteric lymph gland, the germinal follicles were small, the lymphatic cords were heavy and the lymphatic channels contained a sparse number of cells, chiefly lymphocytes.

In a section through the lower lobe of the left lung, the lumen of many arteries, with a diameter of about one half to three fourths of a low power field ($\times$ 80), were filled by mixed thrombi. There was no significant change in the intima, the muscular layer or adventitia. The lumina of most of the bronchi were empty.

Bacteriology.—The only organism isolated from the intestinal content was *B. coli-communis.*

The origin of the emboli in the pulmonary arteries was not known. It was assumed that they came from veins of the lower extremities. In multiple sections of the intestine, there was no evidence of inflammation. The disease began with infection of the upper respiratory tract.

The cause of death was pulmonary embolism and thrombosis.

COMMENT

Autopsy reveals thrombosis of large vessels of the caliber of the femoral or the iliac veins. The etiology of the thrombosis of these veins as the probable site of clot formation consists of a combination of several factors. Those mentioned most frequently are a low circulatory pressure, pressure or operative trauma, low grade infection with the production of phlebitis, constant prone posture, pressure on the vessels through constant flexion of the thighs on the abdomen, and acidosis. In our case, there is the combination of low pressure due to severe dehydration, acidosis, chronic low grade infection of the buttocks, with a possibility of progressive phlebitis, flexion of the thighs on the abdomen and muscular atonicity, the latter two being a possible factor in increasing the venous stagnation.

1658 West Twenty-first Street.

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AN ATYPICAL CASE OF ORGANIC FOREIGN BODY IN A BRONCHUS*

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Organic foreign bodies in the tracheobronchial tree have long been respected by the bronchoscopist because of their tendency to produce both a marked local and a constitutional reaction, and because of the difficulties incident to their removal.

The clinical picture of a typical case in which an organic foreign body, notably the peanut, has been aspirated is so striking as to leave a most vivid impression of grave illness.

Jackson and Spencer [1] stated that the diagnosis of organic foreign body in the tracheobronchial tree is made from (1) the history, (2) dyspnea and restlessness, (3) toxemia and occasional delirium, (4) dusky cyanosis or intense pallor, (5) distressing cough with pinkish-gray, thick, tenacious, purulent sputum and (6) irregular septic type of temperature with pulse and respiration high in proportion to the temperature. The physical examination in these cases usually shows a general diffuse bronchitis with accentuated signs at the point of lodgment of the foreign body, the asthmatoid wheeze, and lessened expansion of the affected side, with impaired resonance and diminished breath sounds and voice distal to the foreign body. Jackson and Spencer stated that no cases have been observed in adults, adding that adults rarely, if ever, aspire peanuts. Another observation of note is that the severity of symptoms is in inverse ratio to the age of the patient. In an analysis of cases the longest sojourn of an organic foreign body was forty-eight days in a child, aged 2½ years, followed by recovery after removal of the foreign body; the shortest sojourn was one day in a child, aged 17 months. This patient died. Jackson and Spencer reported three cases in which death occurred in two weeks without bronchoscopy, the cause of death in each case being exhaustion or toxemia.

In his textbook, Jackson [2] tabulated the salient points on which a diagnosis of organic foreign body in the tracheobronchial tree can be made. They are: (1) initial laryngeal spasm; (2) diffuse purulent

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* From the Oto-Laryngological Service at Bellevue Hospital.

1. Jackson, Chevalier; and Spencer: Arachidic Bronchitis, J. A. M. A. **73:** 672 (Aug. 30) 1919.

2. Jackson, Chevalier: Bronchoscopy and Esophagoscopy, Philadelphia, W. B. Saunders Company, 1922, p. 129.

tracheobronchitis developing within twenty-four hours in children under 2 years of age; (3) fever, toxemia, cyanosis, dyspnea and paroxysmal cough appearing promptly after the initial spasm; (4) the frequent inability of the child to cough up thick, mucilaginous pus through the swollen larynx and consequent possibility of "drowning in its own secretions," and (5) the voice husky but not lost as it is in diphtheria.

In discussing foreign bodies in the bronchi in children, Dietrich and Berkeley [3] stated that the most irritating of all substances inspired into the tracheobronchial tree is the roasted peanut kernel.

Vinson [4] reported a case of a peanut in a bronchus coughed up after a sojourn of about a year. This boy, aged 2 years, was practically without symptoms and appeared so well that the parents refused bronchoscopy for removal of the foreign body.

Kernan [5] reported eight cases in each of which a peanut was aspirated without the production of extensively severe reactions and without fatal terminations. The length of time the nut remained in the bronchus ranged from two days to twenty-three years. In these cases of long duration, marked pulmonary changes had taken place. All of these patients were under 4 years of age at the time the foreign body was aspirated.

REPORT OF CASE

I recently saw a girl, aged 2 years, who had aspirated a peanut one week previous to admission to the hospital. The incident would have gone unnoticed except that the mother had been a nurse and had recently had an experience with extraction of a foreign body in another child. Consequently, an x-ray picture of the chest was immediately taken. No pathologic condition was discovered. The child's temperature remained normal and she acted normally in every way except that she had a brassy, nonproductive cough every morning, which subsided within an hour. She never had dyspnea, pallor or cyanosis. The mother, however, was "not sure that everything was all right" so brought the child for bronchoscopic examination.

On admission to the hospital the temperature was 100 F. by rectum, the pulse rate 130 and respirations 36. The color was good, and the child appeared entirely normal. The physical examination showed nothing important, except râles scattered over both sides of the chest anteriorly and posteriorly, more noticeable on the left side. Roentgen examination showed "diminution of illumination suggesting some pulmonary condition in the right lung with compensatory emphysema in the left lung."

On Sept. 15, 1928, the day of admission to the hospital, a 5 mm. bronchoscope was passed for diagnosis. The tracheobronchial mucous membrane was congested, and there was considerable mucous secretion in both trachea and bronchi. On the right side, no foreign body was seen. On the left side, at the mouth of the branch

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3. Dietrich, H., and Berkeley, H. K.: Foreign Bodies in Bronchi in Children, J. A. M. A. **81**:1202 (Oct. 6) 1923.

4. Vinson, P. P.: Spontaneous Expulsion of Peanut Kernel One Year After Aspiration, Arch. Otolaryng. **3**:59 (Jan.) 1926.

5. Kernan: Laryngoscope **36**:823 (Nov.) 1926.

of the bronchus of the lower lobe of the left lung, a small grayish-yellow foreign body was seen surrounded by a considerable quantity of mucus. It disappeared into the bronchus, then appeared with coughing. After this coughing spell vision was obscured, and no anatomic landmarks could be made out. The bronchoscope was consequently removed, and when the distal end of the instrument was examined a piece of peanut was found firmly wedged into its mouth.

Forty-eight hours after bronchoscopy, the child developed such a marked laryngeal stridor that tracheotomy was done. The temperature rose to 102, but fell to 100 twelve hours after tracheotomy.

Ten days after tracheotomy, the tube was removed.

The child made an uneventful recovery and was discharged from the hospital, Sept. 30, 1928.

This case was interesting to me because the usual symptoms did not appear. The history gave little help, because there was no definite knowledge of aspiration of a foreign body; there was no fever or other signs of constitutional reaction, and the only local symptom that might have been caused by the presence of a foreign body was cough, which was transitory in character and nonproductive. The physical signs were not convincing. Even the combination of history and physical signs did not give any striking clue, and the two roentgen examinations gave little information. Without the mother's fear that everything was not as it should have been, this child might possibly have gone on for some time until the development of pulmonary changes would have made it imperative that something be done.

CONGENITAL HEMOLYTIC ICTERUS

TREATMENT WITH SPLENECTOMY; REPORTS OF TWO CASES *

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Numerous reports are found in the literature concerning the excellent results obtained with splenectomy in the treatment of familial hemolytic icterus.[1] We observed two sisters with familial hemolytic jaundice for sixteen and a half months. During this time frequent examinations of the blood were made. Before splenectomy,[2] the increased rate of production of red blood cells and the increased fragility of the red cells, associated with jaundice and a moderate degree of secondary anemia, were consistently present. Immediately following splenectomy, the blood bilirubin and the absolute number of reticulocytes (young red blood cells) returned to normal.

REPORT OF CASES

CASE 1.—*History.*—On March 16, 1927, the younger sister, aged 5, was brought to the outpatient clinic following an indiscretion in diet. A definite icterus was observed and the abdomen was enlarged and tender. The time when icterus first became evident could not be ascertained. On March 26, 1927, the patient was admitted to the ward, and further observations were made during subsequent admissions. She had had the usual diseases of childhood; her health had otherwise been good.

The mother, the oldest sister, aged 12, and a younger brother were living and well, with no evidence of hemolytic jaundice. The father died at the age of 35, having suffered for eleven years from recurrent attacks of jaundice. Twice in a

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* Submitted for publication, Dec. 13, 1928.

* From the Medical Research Laboratories, Indianapolis City Hospital.

1. Chauffard, A.: A Case of Congenital Jaundice Cured by Splenectomy, Bull. et mém. Soc. méd. d. hôp. de Paris **49**:938 (June) 1925. Giffin, H. Z.: Haemolytic Jaundice; A Review of Seventeen Cases, Surg. Gynec. Obst. **25**:152, 1917. Kahn, B. L.: Hemolytic Jaundice with Recovery by Splenectomy, Arch. Pediat. **43**:610 (Sept.) 1926. Mayer, K.: Splenectomy in Congenital Hemolytic Jaundice, Deutsche Ztschr. f. Chir. **171**:1, 1922. Mayo, W. J.: The Relation of the Spleen to Certain Obscure Clinical Phenomena, M. Rec. **92**:705, 1917. Peck, Charles: Splenectomy for Hemolytic Jaundice, J. A. M. A. **67**:788 (Sept. 8) 1917. Sauer, H.: Congenital Hemolytic Jaundice; The Value of Splenectomy, Mitt. a. d. Grenzgeb. d. Med. u. Chir. **32**:696, 1920. Tileston, W.: Hemolytic Jaundice, Medicine **1**:355 (Aug.) 1922.

2. The splenectomies were done by Dr. Murray N. Hadley, Indianapolis.

period of five years he sought medical advice because of indigestion and constipation. Splenomegaly and cervical and axillary lymphadenopathy were present before his death, which occurred in another city. A postmortem examination was not made.

Physical Examination.—The child was well nourished, active and seemingly well. The skin and conjunctivae showed a moderate degree of icterus. Pruritus was absent, and there were no xanthomas. Bradycardia and other abnormalities of the cardiac function were not present. The liver and spleen extended two fingerbreadths below the costal margins, but were not tender. The circumference of the abdomen midway between the xiphoid process and the umbilicus was 53 cm. Abdominal tympany was constantly present, but ascites and signs of portal obstruction were absent. The faucial tonsils and adenoids were large. There was a moderate generalized lymphadenopathy.

CASE 2.—*History.*—The elder sister, aged 9, was admitted on June 22, 1927. It was the mother's belief that a mild degree of icterus and an enlargement of the abdomen had been present since birth. Although the patient had never been robust, symptoms of crises were not present in the history. She was admitted to the ward for further study.

Physical Examination.—The patient was well nourished, with a moderate icteric tint to the skin and sclerae. Splenomegaly and hepatomegaly were present, the spleen projecting four fingerbreadths below the costal margin. The circumference of the abdomen, half way between the xiphoid process and the umbilicus, was 60.5 cm. The faucial and pharyngeal tonsils were extremely large, the former almost meeting in the midline. The cervical lymph glands were greatly enlarged, and the axillary and inguinal glands were somewhat enlarged.

CLINICAL PROGRESS

During the first fifteen months, the general condition of the patients remained about the same. There was some improvement in their general health and in their red blood counts, which might have been accounted for by general care. The degree of jaundice observed clinically was variable from time to time. There was a moderate enlargement of the abdomens, but the spleens, during this preoperative period, did not change appreciably in size. Signs and symptoms referable to the crises of the disease and to cholelithiasis were not observed. There was no evidence of gout or epistaxis.

LABORATORY OBSERVATIONS

A moderate degree of secondary anemia persisted for a greater part of the time preceding the splenectomy. Normal red blood cell counts were never maintained. There was little correlation between the level of the red blood cells and the percentage (or absolute number) of reticulocytes per cubic millimeter, determined at the same time. Thus, there was no evidence to point to the fact that blood crises were occurring in the absence of clinical signs or symptoms. Following splenectomy, the red blood cell counts rapidly returned to normal. There was an equally rapid decrease in the number of reticulocytes per cubic millimeter so that they reached normal within a few days.

Recticulocytes.—The absolute number of reticulocytes per cubic millimeter before splenectomy, although variable, was always higher than normal (tables 1 and 2). The average number of reticulocytes per cubic millimeter of blood for the fifteen months prior to splenectomy in case 1 was 376,155, or 9.8 per cent of the average red blood count for the same period. In case 2, the average number of reticulocytes per cubic millimeter was 349,519, or 10 per cent. The upper limit of a normal count may be assumed to be 3 per cent.

Within a surprisingly short time following splenectomy, the number of reticulocytes reached approximately a normal level. The average number per cubic millimeter for the first six weeks following the operation was 94,971, or 1.99 per cent, in case 1 and 108,115, or 2.2 per cent, in case 2.

A relationship was seen between the number of reticulocytes and the quantity of bilirubin in the blood. The destruction of red blood cells was partially compensated for by an increased production of young red blood cells. Following splenectomy, the rate of both destruction and production of red cells was retarded and approached that observed in the normal physiologic processes.

Hemoglobin (Newcomber Method, Haldane Scale).—There was some improvement in the percentage of hemoglobin before operation, but it was not marked until after the spleens were removed. The average determination for the fifteen months prior to splenectomy was 60.1 per cent in case 1 and 57.7 per cent in case 2. After splenectomy the average was 70.3 per cent for case 1 and 73.5 per cent for case 2.

Bilirubin.—The quantity of bilirubin in the blood was variable but always greater than normal (tables 1 and 2). Following splenectomy no bilirubin, or only a faint trace, was detected in the blood. It is interesting that the bilirubin content of blood removed from the splenic vein at the time of operation was no greater than that found previously in the general circulation (table 2).

Fragility of the Red Blood Cells.—A decreased resistance of the red blood cells in hypotonic solutions of sodium chloride was not improved by removal of the spleens (table 3). The bloods of the mother and oldest sister were tested and the resistance of their cells was found to be normal (table 3).

Diameter of the Red Cells.—The diameter of the erythrocytes was apparently less before splenectomy than afterward. These observations are in accord with those of Whitcher,[3] Boros [4] and others. In each case

3. Whitcher, B. R.: Microcytosis in Hemolytic Jaundice, Am. J. M. Sc. **170**:678, 1925.

4. Boros, J. V.: Diameter, Volume and Form of Human Erythrocytes and Their Interrelation: Microcytosis in Hemolytic Jaundice, Wien. Arch. f. inn. Med. **12**:255 (Feb.) 1926.

TABLE 1.—*A Comparison of Observations on the Blood Before and After Splenectomy in Case 1*

Date	Red Blood Cells, Millions per Cubic Millimeter	Reticulocytes, Millions per Cubic Millimeter	Bilirubin, Mg. per 100 Cc. of Plasma	Hemoglobin, per Cent (Newcomber)
Before Splenectomy				
3/29/27	2.69	....	....	50.0
4/ 2/27	2.77	0.53	....	50.4
5/10/27	4.81	0.66	0.70	65.7
5/19/27	4.02	0.32	0.38	54.3
6/22/27	3.06	0.37	....	54.8
6/28/27	4.43	0.68	....	64.4
7/ 1/27	3.47	0.40	....	52.0
7/ 8/27	3.45	0.38	....	56.8
7/16/27	3.44	0.37	....	58.9
2/11/28	3.23	0.29	....	65.0
2/14/28	....	....	1.15	....
2/19/28	3.44	0.24	....	52.0
2/23/28	3.94	0.35	1.29	59.0
2/25/28	3.40	0.22	....	60.0
3/ 2/28	4.09	0.31	....	62.0
3/ 8/28	4.48	0.31	....	65.0
3/18/28	3.96	0.26	....	61.0
5/12/28	4.06	0.46	....	61.0
5/23/28	....	....	0.70	....
5/25/28	3.92	0.22	....	....
After Splenectomy				
5/27/28	5.26	0.32	....	71.0
5/29/28	4.19	0.37	....	71.0
6/ 1/28	4.32	0.01	....	64.0
6/ 4/28	4.65	0.05	....	73.0
6/ 8/28	4.92	0.01	....	71.0
6/10/28	4.64	0.23	....	61.0
6/11/28	....	....	None	....
6/20/28	....	....	Faint trace	....
6/25/28	4.97	0.34	....	75.3
7/ 5/28	4.92	0.00	....	75.3
7/10/28	5.03	0.03	None	71.8

TABLE 2.—*A Comparison of Observations on the Blood Before and After Splenectomy in Case 2*

Date	Red Blood Cells, Millions per Cubic Millimeter	Reticulocytes, Millions per Cubic Millimeter	Bilirubin, Mg. per 100 Cc. of Plasma*	Hemoglobin, per Cent (Newcomber)
Before Splenectomy				
5/10/27	3.50	....	0.78	62.5
5/19/27	3.39	....	0.52	56.8
6/23/27	3.31	0.39	....	56.8
6/28/27	3.71	0.31	....	65.8
7/ 1/27	3.87	0.49	....	54.8
7/ 8/27	3.89	0.42	....	60.0
7/16/27	3.29	0.29	....	57.3
1/15/28	....	....	1.20	....
2/ 4/28	3.69	0.44	1.29	60.0
2/11/28	3.36	0.39	....	58.0
2/19/28	2.72	0.26	....	51.0
2/23/28	2.93	0.42	1.36	55.0
2/25/28	3.06	0.26	....	54.0
3/ 2/28	3.40	0.34	....	56.0
3/ 8/28	3.20	0.31	....	53.0
3/17/28	3.00	0.23	....	52.0
5/12/28	3.82	0.46	....	56.0
5/23/28	....	....	1.02	....
5/25/28	4.11	0.23	....	54.0
After Splenectomy				
5/27/28	5.20	0.37	....	....
5/29/28	4.26	0.31	....	71.0
6/ 1/28	3.57	0.07	....	58.0
6/ 4/28	4.96	0.10	....	73.0
6/ 8/28	4.55	0.01	....	73.0
6/10/28	4.93	....	....	76.0
6/20/28	....	....	Faint trace	....
6/25/28	4.68	0.02	....	71.8
7/ 5/28	5.28	0.03	....	72.0
7/10/28	4.97	0.01	None	71.0

* Blood plasma collected from the splenic vein at the time of operation contained 1.07 mg. of bilirubin per hundred cubic centimeters.

200 cells were measured three months before and six weeks following operation. In case 1, the average diameters before and after operation were 6.509 and 7.281 microns, respectively. In case 2, the average diameter increased from 6.737 to 7.297 microns. Since the red blood cells return to a normal size following the removal of the spleen, Whitcher [3] believed that the microcytosis is caused by a malfunction of that organ.

Auto-Agglutination.—Auto-agglutination was seen before and after splenectomy. On March 17, 1928, definite microscopic clumping of the cells was found; macroscopically, a definite, although fine, reticulum containing many red cells was seen. Following splenectomy the phenomenon was again observed both microscopically and macroscopi-

TABLE 3.—*The Fragility of the Red Blood Cells in Hypotonic Salt Solution*

Case	Time	Date	Per Cent of Solutions: 0.70	0.65	0.60	0.55	0.50	0.45	0.40	0.35	0.30	0.25	0.20
1	Before splenectomy												
		5/19/27											
		1/30/28											
		5/12/28											
		5/25/28											
	After splenectomy	7/10/28											
2	Before splenectomy												
		1/30/28											
		3/12/28											
		3/25/28											
	After splenectomy	7/10/28											
Mother		3/12/28											
Oldest sister		5/25/28											
Normal person		.....											

cally. Some of the cells, however, were in rouleau formation and were not definitely clumped.

Eosinophilia.—The percentage of eosinophils was not increased in case 1 until forty days after the splenectomy, when it reached 5.5 per cent. In case 2 the percentage of eosinophils increased from normal to 5 per cent thirteen days after splenectomy, and to 9 per cent six weeks later.

Negative Observations.—In one determination before, and one after, removal of the spleens, the cholesterol content of the plasma was found to be normal, by the modified Myers-Wardell method.[5]

The total nonprotein nitrogen and uric acid content of the blood before splenectomy was normal.

5. Hawk, P. B., and Bergheim, O.: Practical Physiological Chemistry, Philadelphia, P. Blakiston's Son & Company, 1926, pp. 391-393.

On three occasions, the bleeding times were found to be normal. The color of the stools was normal, and bile was never found in the urine. Hematuria was not observed in either case. Roentgenograms did not show the presence of gallstones.

Pathologic Data.[6]—Grossly, the spleens were enlarged and were apparently normal. In case 1 the diameter of the spleen was about 10 cm. and it weighed 145.6 Gm. In case 2 the spleen was 14.5 cm. long and 9.5 cm. wide, and it weighed 261 Gm.

Microscopically, the observations were negative except for the large amount of blood in the splenic pulp. There was no evidence of erythrophagocytosis, and excessive amounts of bile pigment were not present.

SUMMARY

1. Two sisters, aged 5 and 9, with congenital hemolytic icterus were observed for fifteen months before splenectomy without clinical or hematologic evidences of a crisis.

2. Following splenectomy, the red blood cells, hemoglobin content, blood bilirubin and reticulocytes returned to approximately normal levels within a comparatively short time.

3. After splenectomy, the diameter of the red blood cells increased. In the fragility tests, however, the results were unchanged.

4. Eosinophilia was observed in both instances during the postoperative course of the disease.

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6. Gross and microscopic studies of the spleens were made by E. Vernon Hahn, M.D., and Elmer Funkhouser, M.D.

Progress in Pediatrics

THE PREVENTION OF NERVOUS AND MENTAL DISORDERS IN CHILDHOOD*

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Psychiatry is probably the last of the medical sciences to join the family of preventive medicine. Its arrival has been somewhat tardy, but its place in this group is becoming more secure and more important as time goes on and as the ramifications of this field become more and more evident. It is true that in the past psychiatry has had a somewhat insecure place in medical thinking. I was reminded of this just the other day when an intelligent person asked me if I ever intended to go back to the practice of medicine. Be that as it may, it is certain that the understanding and control of the variety of factors which can and do lead to behavior and mental deviations in the child must form the foundation for stemming the flood of human beings which is flowing into the hospitals for mental diseases and for whose care there are more hospital beds provided than for all other forms of sickness combined.

The increasing interest in the mental hygiene of the child is based on the fundamental and scientific fact that the behavior of human beings is dynamic and adaptive, that it is built up of life experiences and relationships, and that it is modifiable to the extent that the stimuli to which behavior is reactive can be modified or changed. In other words, behavior patterns are not static or fixed; they lend themselves to control.

The science of psychiatry has been held back by the point of view which has insisted too rigidly on the fixity of behavior and personality patterns, which emphasized a blind and fatalistic type of heredity and which sought most of the reasons for mental disease in the fixed constitutional make-up of the person. This has throttled investigation of the individual in relation to his own life situation and has held back the realization that the plastic period of childhood, even in people with a black spot in their ancestral past, had a tremendous influence on the quality of the behavior throughout life.

* Submitted for publication, Dec. 1, 1928.

* Read before the Philadelphia Pediatric Society, Jan. 10, 1928.

In a sense, all preventive medicine has been hampered by the same point of view, a view which held that the person who became diseased had a potentiality toward disease rather than toward health, and that saving such individuals weakened the race. If such a fatalistic philosophy had ruled the medical profession, the vast strides toward the goal of preserving the public health would not have been accomplished. Psychiatry has been less fortunate in freeing itself from this conception in the past, and its preventive interests have been smothered at the source to a considerable extent. No one can get very excited about the type of prevention which concerns only vague and far distant measures to improve the quality of the race (important as this may be) and which allows avoidable and controllable situations that warp the personalities of potentially normal persons to go uncorrected. The fundamental difference in the more fatalistic approach and the mental hygiene approach is simply this: The former deals with prevention in terms of what can be accomplished in future generations, and the latter, while also concerned with this, deals chiefly with the major preventive interests in terms of the present generation and the understanding and control of those situations which lead to behavior deviations, particularly in the child.

This fundamental belief in the modifiability of behavior patterns is the foundation of work which aims to prevent behavior abnormalities in the child, and to treat them when they occur. I shall discuss two cases as illustrations of this point of view and of what can happen when situations (stimuli) are modified.

REPORT OF CASES

CASE 1.—A boy, aged 5 years, was referred to the Child Guidance Clinic because he was regarded as insane by the attendants at a day nursery where he was cared for during the day hours. This impression was created by the following behavior. From the time that he was about 3 years old he had had violent screaming spells, and would attack adults and children whenever they tried to get him to do simple routine things, such as take a nap. He would fly at them screaming "I will kill you." Frequently he rushed at persons without any provocation and scratched and bit them. He was also regarded as abnormally interested in sex. He masturbated and liked to fondle the women at the nursery, which shocked these attendants. He was cruel to the other children and kept the nursery so disturbed that he was considered a serious menace. All the assistants threatened to leave if the boy was not sent away. This type of behavior had continued for well over a year and was thought to be getting worse.

When the behavior was studied more carefully, it was found that he was not a problem in the kindergarten two blocks away. There he was able to adapt himself very well to group activity and did not stand out as being different from the other children. This suggested rather clearly that there must be something about the nursery setting which stimulated the type of behavior just described.

When the family background of the child was studied, the following facts seemed most important. The family was made up of father, mother and four

children, the patient being the youngest. The father was a very unstable man, who had never adequately supported his family and who was abusive and cruel to both wife and children, so that for a long time they were in a continual state of tension and fear. The staff of the day nursery, knowing of this condition, advised the mother to have the father taken to court and to refuse to let him stay at home. She did this, and the court ordered him to stay away. He then abused the nursery, and in the frequent contacts which he had with this boy he raved continuously about the way in which he had been treated and said that the nursery had broken up the home. It was easy to see how badly conditioned the nursery was in the mind of the boy, and how the child became associated by the nursery with the abnormal behavior shown by the father.

Added to this situation and the tension of his own home was the unwise handling of the boy in the nursery. They were obviously shocked by the activity which they interpreted as excessive interest in sex. They noticed most of his minor deviations in behavior and nagged him a great deal, which helped to set the stage for his difficult and dramatic conduct.

In the clinic, it was noted that he was physically well developed and had average intelligence. It was interesting to note how quick he was to respond to the attitude of the examiner, and how he would talk at great length about topics which excited his interest or attracted his attention. He readily demonstrated how he screamed at night and how he attacked people. As this interest was kept up, he became more and more active and began racing around the room. Then as interest in what he was doing was withdrawn, one could observe the behavior becoming quieter until he finally became quite calm. His behavior could be altered at will by the attitude taken toward him; the same was true of the topics of conversation. In one interview the subject was good and bad boys; he said that good boys went to heaven and played music and bad boys went down to the devil who had a big pitchfork and jammed them into a hole. He would amplify his discussion by drawing pictures of the devil. When he saw I was interested in this unusual conversation, he kept it up, and I could not get him to talk about anything else.

It was clear that I was dealing with an unusually responsive, sensitive child, who adapted his behavior to the situation and who could be stimulated and quieted at will. The abnormal behavior in the nursery was the continual response of the child to a place badly conditioned by the father, and made continually active by the methods used in handling him.

A change was effected in his program as the necessary step in changing stimuli. His mother had to work, so he had to be cared for during the hours that he was not in kindergarten; he was therefore placed under the care of a woman who was fond of children but not overdemonstrative or easily upset. She knew when to leave children alone, and allowed them to be natural.

His dramatic behavior, so prominent at the nursery, stopped at once. He made friends quickly, accepted little responsibilities, took his afternoon nap and generally seemed less tense and excitable. He did have many fears, particularly of the dark, and even during the day did not like to go upstairs alone. Sensibly managed, he soon overcame this. Three months later, however, when he returned to the nursery for a Christmas party, he behaved exactly as he had done while he was being cared for at the nursery. He raced around, screamed and almost broke up the party.

A problem of more than two years' standing was radically changed in a short time. The behavior was understandable in terms of this child's own life experiences. In view of the unstable behavior of the

father, it would have been easy to have ascribed a more fixed quality to it and to have assumed a less hopeful attitude toward modification.

CASE 2.—A girl, aged 6 years, was referred because her peculiar behavior had led to a diagnosis of dementia praecox and the recommendation of her commitment to a home for defectives as the only possible thing to be done. A hopeless prognosis had been given, and the behavior was such as to warrant one being somewhat guarded. This child would lie in bed for an hour at a time laughing and talking to herself and on a few occasions stayed awake most of the night. (There was nothing in the history to suggest encephalitic disturbance.) She seemed to react to imaginary persons, who would come in the room and prevent her from eating. She would argue with these people, and say to them, "Don't bother me." "You think you're smart, don't you?" Frequently she would hide in a closet for an hour at a time to get away from them. At other times she would stand as if in a stupor, and would urinate and defecate on the floor. She would have nothing to do with other children, and during the few weeks she spent in the kindergarten she did practically nothing but sit and look off into space. She had no interest in dolls or any of the usual playthings of children. She had been behaving in this manner for over a year. The following seemed to be the important facts in the child's background. There had always been a serious maladjustment between the parents, based partly on religious differences and partly on continual interference in the home by the mother's family. This child became the center of the religious quarrel, one insisting on a Catholic baptism, the other on a Presbyterian. Periodically, the mother would go home to her mother and after a few weeks return. She had a violent temper and was erratic in her discipline. At the time this study was made she was seriously ill with pulmonary tuberculosis, and the child had been a frequent visitor at the hospital.

Added to this unstable situation in the home, a brother a year older than the patient had died. This apparently made a deep impression on the girl as she talked about him a great deal, spoke of him as being in a hole in the ground and frequently asked when he was coming back.

The examination at the clinic revealed a slightly undernourished child, who presented no other physical disturbance. It was hard to estimate her intellectual ability, but it was certain that she was not mentally defective. She was shy, had a vacant facial expression and was rather unresponsive. She spoke of the voices and faces which she said were those of Jews, and that she could shoo them out of the door. It was evident that it was desirable to have this child away from the home and under neutral conditions where her behavior could be studied, and to determine how far one could recondition behavior of this type. She was placed in a hospital for two weeks and then in a convalescent home for children for seven months.

The first report from the hospital was that she had shown relatively little of the behavior described. At first she stayed by herself and talked to herself in a fairly natural make-believe way, but as she became acquainted she was sociable and tried to show off a great deal. When this gave her no additional attention, her behavior became natural. There was no soiling during the entire period away from home.

In the convalescent home, she entered the first grade and got along moderately well. It was noted that she was sensitive to ridicule, and if a child laughed at some mistake, she would not say a word for the rest of the day. This trait became less noticeable as time went on. At present she is living with an aunt and her father under fairly normal conditions, and she is happy and cheerful. She seems to be in a condition in which healthy behavior traits can be built up.

COMMENT

These two cases are presented in some detail to support the basic contention of mental hygiene, namely that behavior is dynamic and adaptive and can be directed into different channels as one modifies the stimuli. If this is possible in patients presenting such unusual behavior, it is even more true in the more common behavior patterns noted in the early period of childhood. The main problem of a preventive program in this field is the determination of the types of situations and relationships which form obstacles to the development of normal personality and the working out of a technic for modifying or removing them.

The position of the parents in the developmental program of the child is probably the most important of all the influences which make up his small child world. He is entirely dependent on them during the early period of his life. Development is measured in terms of his increasing ability to do the many things which are done for him in this early period and to rely more and more on his own effort, freeing himself from the early dependent relationships with his parents, particularly his mother. A snag is commonly struck at this point because the child so commonly becomes enmeshed in the emotional difficulties of the parent, and around him revolves a complex series of events which hinder emotional growth. For example, this situation is common: a mother who has been left a widow or whose marital situation is unsatisfactory, seeks satisfaction for her own emotional needs from the child. All her hopes and fears focus here. The child is overprotected; too much is done for him. He is not allowed a natural setting in which to grow and learn. Recently, I saw a boy of 10 who had been stealing. Study of the background revealed that his grandmother had always made him her pet and had done everything for him; she had always defended him and feared that he would get hurt in rough games. Why should not this boy steal when he had been getting things for nothing all his life and had never been allowed to rely on his own efforts? In another instance, another grandmother (a book could be written on the influence of grandmothers on children) lost her husband at the time the child was born. Up to this time she had never had any interest in children, but suddenly deprived of the only source of satisfaction for her own love life, she sought further satisfaction in this child. Her care, fretting and worry over this boy was constant. She may have hoped for the best, but she was always anticipating the worst. The result was a timid and rather fearful boy who at the age of 9 had little confidence in himself and was constantly comparing himself with other boys. Recently he has developed panic states at night fearing that he is dying or that he has been lost, and it takes the whole household to quiet him. All of this could have been avoided if the child had been allowed his

fundamental right to develop as an increasingly self-sufficient individual having more and more confidence in his own capacities. Instead he was thought of as a hothouse plant, a pet and a satisfier of adult emotional needs; the result is only too evident.

There are many other aspects of this parent-child relationship, or the adult-child relationship which are most important in this problem. The modern home, particularly the apartment home, is organized for the adult, and into it the child has to fit in the best way he can. Normal behavior and activity has to be interfered with because it is disturbing and annoying. This means that there is too much needless interference with a great many children, and when interference becomes essential the effect is not always desirable. One of the hardest things that a parent has to learn is when to let the child alone and when correction and interference are necessary for proper training.

Sound physical health is essential for the development of a wholesome personality. Sound medical judgment and common sense tell one that physical disorders of a major or of a minor significance are an obstacle in the proper functioning of the total organism. Every mental hygiene program, therefore, must pay proper attention to the physical welfare of the child. Physicians, however, must be aware of the fact that the attainment of physical health does not necessarily insure healthy mental traits, and the handling of these physical problems is a matter of great importance. For example, there is danger of so centering the child's interest on his health development that he becomes neurotic and introspective to an unhealthy extent. This is usually a reflection of the concern of parents which frequently goes back to casual remarks dropped by the family physician. The present emphasis on weight charts and other health situations in the schools sometimes leads to unnecessary concern on the part of children and parents. Some teachers take these matters too seriously and cause those who are easily disturbed about themselves to become concerned because they are two or three pounds underweight. A proper sense of values is frequently absent in those who fail to see the total situation of the child, and too much concern is manifested about the physical welfare; the results are reflected in the number of adolescent and adult neurotic persons in the world. Neurotic tendencies seem to develop much less frequently in those children and adults who have a major physical disability, particularly if the parents have been sensible in their attitude toward this handicap. These tendencies develop more often on the basis of a minor physical ailment which becomes a defense and an excuse for shortcomings.

Another potential source of difficulty for the child is the timidity and aversion of the parents concerning the sex education of children. The fact that one has to speak of sex as apart from other types of education is an indication of the general timidity and fear on this subject. Par-

ents who are able to handle this subject naturally and as a part of the general education of the child, giving satisfactory answers to the simple questions that children bring up, are those who create in their children natural and wholesome frankness about this subject. Parents who evade answering simple questions and who put off the answers until the child is older are usually the ones who never face the problem. When the child is in early adolescence they may take him to the physician or teacher and say, "Please give my child sex instruction."

Parents who make a special task of imparting this mysterious information usually talk about the dangers of self-abuse; they point out that this habit destroys the mind and body, and they so frighten the child that they probably never have another opportunity to talk to the child about this in a natural way. Masturbation is almost a universal method of getting sensory pleasure in childhood, and it becomes a problem when it is loaded down with the emotional attitudes of adults who never had the subject properly handled in their own childhood.

Fear methods in handling the problem of self-abuse never accomplish anything constructive. Such methods may stop the habit, but they introduce feelings of guilt, a loss of self-respect and the belief that a few simple acts have brought permanent harm. Every psychiatrist has seen the results of these conflicts in adult life in the form of self-accusations and other types of delusions. An important part of a preventive program is the helping of parents to take a wholesome and natural attitude toward the problems of sex in their own lives and to avoid some of the mistakes that have been made with them in their own childhood. Most parents avoid the subject of sex because their parents were afraid to be honest and objective on this subject.

No child is ever helped to a wholesome respect for himself by being made the object of ridicule or by being humiliated by an adult. The preservation and development of self-respect and self-confidence is the most important goal of all child training. I talked with a young girl the other day who has an intense hatred for her father, largely because he used to ridicule her because she was overweight and not quite as feminine as he would like to have had her. The teacher who publicly humiliates a young child is guilty of violating a fundamental right of childhood. When a child loses confidence in himself or never gains it, there is a train of compensatory behavior which may take any form of abnormal activity.

It would be impossible to cover the sources of behavior difficulties of children in this short paper. The important point to realize is that a large proportion of these sources are a part of the child's own life and are avoidable. The degree to which they will be avoided depend on the insight, intelligence and objectivity of those who make up the early world of the child; on their ability to keep the child more or

less free from their own emotional entanglen.ents, and on their realization that the goal to be attained is the development of a new healthy individual in society capable of standing on his own feet and having confidence in his own capacity to live, to produce and to develop harmonious relations with his fellow beings. The parents who derive their satisfactions from seeing this development and the accomplishments of their children, rather than those who feel themselves growing less and less necessary as their children become more and more self-sufficient, are the ones who will be able to avoid many of the mistakes that cripple the child in his developmental period.

Pediatric Biographies

FRANCISCUS SYLVIUS
1614-1672

JOHN RUHRÄH, M.D.
BALTIMORE

François Dubois was known in his youth as Franciscus de le Boë, but after he received his medical degree he began to use the latinized form Franciscus Sylvius. His father left France on account of religious persecution and settled in Hanan, Germany, where Francis was born in 1614. He was sent to school in Sedan, and then after the fashion of the day he started on his travels through France, with a sojourn at Paris, then through the Netherlands and Germany. He studied physics, botany and zoology as well as chemistry and anatomy. When he was 23 years of age he reached Basel, where he was admitted to the profession of medicine, after which to returned to Hanan and practiced there for two years. But he needed a larger field for his activities, so he removed to Paris and later to Leyden. Here he began to teach anatomy.

A number of structures in the brain bear the name of Sylvius: the fissure, the aqueduct, the fossa, the ventricle and the artery. The description of these was formerly ascribed to Jacobus Sylvius, one of the teachers of Vesalius, but, as Baker has pointed out, Franciscus really deserves the credit. The aqueduct had been noted by Galen and observed by Arantius in 1587.

He was a popular teacher and lecturer, and students flocked to his anatomy courses from all over Europe. Many of his pupils made names for themselves. There was Willis, who with Richard Lower studied the brain; de Graaf, who described the graafian follicles; Stenson, who demonstrated that the heart and arteries are constructed of muscle; Swammerdam, who wrote about the red blood corpuscles, and van Hoorne, of thoracic duct fame. Here it was that Sylvius did so much to disseminate Harvey's discovery of the circulation of the blood.

When Sylvius was 42, he removed to Amsterdam; about two years later Kyper, the professor of medicine at Leyden, died, and Sylvius returned to occupy his chair until his death. His second wife and daughter died in 1669 of some sort of petechial fever, probably typhoid. Sylvius had the disease but recovered, only to be stricken again three years later. Sylvius remarked to Schacht anent his illness: "I know as well as you the seriousness of the disease from which I escaped three years ago. This time I shall die." He is buried in St. Peters Church

in Leyden, which he had caused to be erected seven years before. It bears a Latin inscription which he composed himself. The translation of this reads:

Franciscus de le Boë Sylvius,

Professor of the Practice of Medicine.

Mindful of human infirmity
and of the often stealthy approach of death,
bethought him to prepare against that time
a quiet sephulchre for his remains,
a house for his mortal body,
at Leydon.

1665

Sylvius contributed much to the advance of medicine, not only in anatomy, in which he was the acknowledged authority of his day, but in chemistry, physiology and in medical education. He gave his students bedside instruction, a rare or unheard of thing at that time; he had ideas on the action of some of the digestive juices and the endocrines. He had enemies and detractors. Walter Harris dubbed him the "opium doctor" because of his frequent use of that drug, and his use of antimony led to a saying that he caused more deaths than the Thirty Years' War.

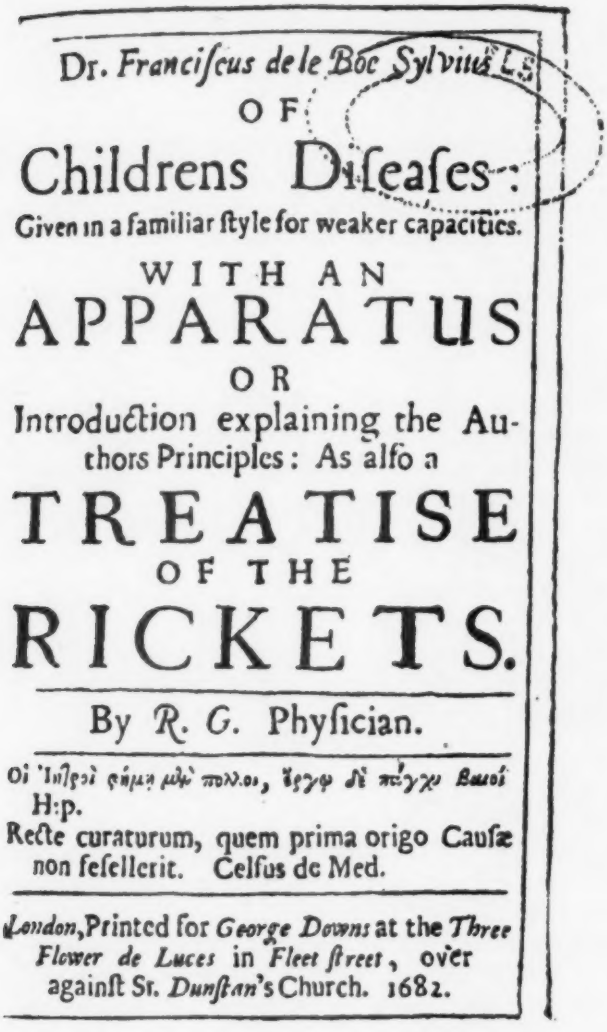
As a pediatrician, he is little known. This phase of his activities is discussed in "Pediatrics of the Past." Sylvius wrote one small pediatric text which was printed in Amsterdam in 1674. It is entitled, "Praceos medicae liber quartus. De Morbis infantum et aliis quibusdam memoratu dignis affectibus. Editus cura Justi Schraderi." It was translated and published in London in 1682 with the title, "Praceos medicae liber quartus. Of children's diseases: given in a familiar style for weaker capacities with an apparatus or introduction explaining the author's principles: as also a treatise on rickets."

He had some knowledge of the use of acids and alkalis, and used aromatics to relieve hiccups. Above all, he understood the tender nature of early life and warned against the heroic measures employed in his day.

A short quotation will give some idea of his style, which is terse and to the point.

19. All *Vomiting is a preternatural Motion of the Stomach;* for none in health vomits; seeing that the *Natural Motion* of the Stomach begins at its upper Orifice, which by a kindly contraction of itself thrusts whatsoever is in it through the Pylorus (that is, its lower orifice) to the Guts.

20. For volatile spirituous things need no preparation in the Stomach; which if they do not meet with any thing in the Stomach to stop them, are straight



Dr. *Franciſcus de le Boe Sylvius* L.S.

OF

Childrens Diſeaſes:

Given in a familiar ſtyle for weaker capacities.

WITH AN

APPARATUS

OR

Introduction explaining the Authors Principles: As alſo a

TREATISE

OF THE

RICKETS.

By *R. G.* Phyſician.

Οἱ Ἰητροὶ φάμεν μὲν πολλοι, ἔργῳ δὲ παυχυ βαιοί
Hip.

Recte curaturum, quem prima origo Cauſæ non feſellerit. Celſus de Med.

London, Printed for *George Downs* at the *Three Flower de Luces* in *Fleet ſtreet*, over againſt St. *Dunſtan*'s Church. 1682.

English edition of Franciscus Sylvius' book on the disease of children.

carried down to the Guts, and from thence to the Heart; whereby the sick are so speedily refreshed, though never so weak before.

26. It is therefore good, to boil Anise, or sweet Fennel seeds in the childs milk; or to put grated Nutmeg into their drink boil'd with bread: whereby the rise of Phlegm will be prevented.

27. If the Childs belly be much swelled with wind, and costive, it is best to give a *Clyster* before the Purge; which Clyster must be made of *emollients and such as expel* wind, with some gentle purger in * it; whereby their hard *excrements will not only be softened,* but *the Wind* it meets with *be expelled,* or *rather* as *it were choaked,* and *settle into the Clyster,* and anon be *sent forth,* as also a *fit way prepared for the humours and wind that will follow* from the upper Guts.

28. By this method in a little time the Wind may be cured, which cannot be on a sudden.

29. But if *sowre Humours* be joyned to the foresaid Wind, or be observed alone, the Cure will be more difficult.

24. For it may happen to Infants as to people of years, that all are not alike easily, speedily or largely purged by any Medicine: for which cause, lest they should get harm by a strong Medicine, it is better to give a gentle Purge at several times, and but a little at a time, rather than together and at once. For a Physician cannot be too cautious, seeing children are tender, and may die upon a small occasion.

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* As for example, Take Marshmallow roots two drachms, Mallow and Rue leaves, of each an handful, which boil in barley-water, strain four ounces, in which dissolve half an ounce of the Catholick Electuary, Oil of Roses two drachms, and give it blood warm.

News and Comment

UNIVERSITY NEWS

Appointments and Promotions.—The Faculty of Medicine of the University of Bordeaux announces the appointment of Dr. Guérin as chief of the Children's Surgery and Orthopedic Clinic, and of Dr. Cueille as associate.

CLINICS

The Municipal Council of Paris has commissioned the Public Aid Association to assist them in maintaining the congenital syphilis clinics organized at the Lariboisière Hospital, and the Baudelocque and Tarnier Clinics.

The Naples Pediatric Clinic was opened recently. Many prominent Italian physicians witnessed the inaugural exercises.

The children's dispensary at 146 Saint-Ouen Avenue, Paris, operated for many years by the women of the French Red Cross, has been enlarged by the addition of forty beds for orthopedic, surgical and other conditions. These were made possible by the gift of an American, Miss Fuerth.

HOSPITAL NEWS

Texas Children's Hospital.—A movement, inspired by leading Texas business men, is now under way in that state to build the first children's hospital in the Southwest, there now being none nearer to Texas than Denver and St. Louis. The institution has been incorporated as a nonsectarian, charitable corporation and will bear the name Texas Children's Hospital. There will be 100 beds, in addition to complete child hospital departments. Construction and equipment will cost $600,000, and a $1,000,000 fund will also be provided to create income for free service. There will be an open-staff policy, admitting any ethical physician to practice within the institution. Funds to build and endow the hospital will be sought in a public appeal before midsummer.

Bequest to Children's Memorial Hospital.—By the will of Mrs. Adeline Wheeler, the Children's Memorial Hospital in Chicago was left $2,000,000, the income of which is to be used for the hospital.

SOCIETY NEWS

New Members of American Pediatric Society.—The following were elected to membership in the American Pediatric Society at the recent meeting in St. Louis, May 20-22: Drs. Charles W. Burhans, Cleveland; Franklin P. Gengenbach, Denver; Alexis F. Hartmann, St. Louis; Horace H. Jenks, Philadelphia; Hugh W. Josephs, Baltimore; James D. Trask, New Haven, Conn.; Edwin T. Wyman, Boston.

Warsaw Pediatric Society.—A meeting of the Academy of Medical Science under the auspices of the Warsaw Pediatric Society was held in honor of Prof. J. Brudzinski, who died on Dec. 18, 1917. Dr. Szenojcka and Dr. A. Szlagowski spoke of him as a great worker who organized a children's hospital in Lodz, and who reorganized the University of Warsaw after the war.

First Convention of Jewish Medical Organization "T O Z" in Warsaw.—The health of Jewish people was discussed at the first convention of the "T O Z" in Warsaw. Most important points were stressed as: tuberculosis, infectious diseases, public hygiene and eugenics, care of infants and hygiene of school

children. Another important point made was that many Jewish children die from infection owing to the unaseptic method of circumcision in which sucking of blood is practiced after the prepuce is removed.

DEATHS

Samuel W. Kelley died in Cleveland, on April 20. Dr. Kelley had long been associated with pediatrics in this country, and is best known, perhaps, for his book entitled "Surgical Diseases of Children." Dr. Kelley was a graduate of Western Reserve School of Medicine in 1884, and was professor of diseases of children at the Cleveland College of Physicians and Surgeons from 1893 to 1910. He was chairman of the Section on Diseases of Children of the American Medical Association in 1900; he was an active member and had served as president of the Association of the American Teachers of the Diseases of Children, and also was a past president of the Ohio State Pediatric Society. He wrote several books besides the one mentioned. He was for many years on the staff of St. Luke's Hospital at Cleveland, where he died, at the age of 73.

Dr. Jacques Sevestre, formerly chief of the pediatric clinic of the Children's Hospital, Paris, and one of the founders of the *Archives de médecine des enfants,* died recently.

Dr. Louis-Jacques Guinon, honorary physician to the Bretonneau Hospital, and officer of the Legion of Honor, has died. He was formerly a director of the *Revue mensuelle des maladies de l'enfance,* and president of the Société médicale des hôpitaux in 1925.

J. Donald Iams, a pediatrician of Pittsburgh, a member of the staff of the Children's Hospital and of Mercy Hospital and a member of the pediatric faculty of the University of Pittsburgh, died March 25, 1929, of pneumonia.

Z. R. Scott, a pediatrician of Pittsburgh, assistant professor of pediatrics at the University of Pittsburgh School of Medicine, died of pneumonia on Dec. 29, 1928.

Abstracts from Current Literature

Anatomy and Physiology

MODIFIED LYMPH NODES FROM DOGS WITH A KNOWN HISTORY OF IRRADIATION, INCLUDING A NOTE ON "GLOBULE" LEUCOCYTE FORMATION. A. B. DAWSON, Anat. Record **36**:1, 1927.

The observations on six lymph nodes from dogs previously exposed to the x-rays confirm the previous observation of Jordan (*Anat. Record* **32**:369, 1926) that erythrocytes can be formed in certain mammalian lymph nodes. Lymphocytes trapped within the sinuses differentiate into red cells, and later disintegrate and pass into solution or are removed by giant cells or mononuclear phagocytes. Jordan regards the presence of blood capillaries as the stimulus to this change; Dawson, however, is inclined to think that lymph stasis is a factor. Globule lymphocytes are regarded as intermediate stages between lymphocytes and red cells.

KUGELMASS, New York.

Pathology, Bacteriology and Biochemistry

CERTAIN EFFECTS OCCASIONED IN DOGS BY DIPHTHERIA TOXIN: A REPORT OF THE VISCERAL LESIONS. HAROLD J. STEWART, Arch. Path. **7**:601 (April) 1929.

Diphtheria toxin, when injected into dogs in amounts of from 0.00135 to 0.00168 cc. per kilogram of body weight, caused death in from two and one-half to twenty-two days. Clinically, the dogs lost weight and frequently developed jaundice. At autopsy, the most striking change was found in the liver, which showed central necrosis and phagocytosis of what seemed to be nucleated red cells by the Kupffer cells. Histologically, no change was found in the heart muscle, but there was a decrease in the relative size and weight of the heart, and the ratio of the weight of the left to the right ventricle was below normal. Electrocardiograms showed a decrease in the R wave in leads II and III.

LESLIE, Evanston, Ill.

EFFECT OF EXERCISE ON PROPORTION OF CORPUSCLES IN HUMAN BLOOD. F. W. KRZYWANEK and A. ARNOLD, Arch. f. d. ges. Physiol. **216**:640, 1927.

Exercise causes an increase in the percentage of corpuscles in the blood of human beings, not so great, however, as in the case of dogs and horses.

THE SPLEEN AS A RESERVOIR FOR RED BLOOD CORPUSCLES. A. SCHEUNERT and F. W. KRZYWANEK, Arch. f. d. ges. Physiol. **217**:261, 1927.

The fluctuations in the number of red blood corpuscles during rest and exercise do not take place after splenectomy. The conclusion is drawn that the spleen is the only reservoir of red blood corpuscles.

KUGELMASS, New York.

BUTTERMEAL MIXTURE IN INFANT FEEDING. A. BARBOZA, Arch. de pediat. Rio de Janeiro **5**:151 (Feb.) 1929.

Barboza uses Czerny's buttermeal feeding combined with milk in the following proportions: for a child who weighs less than 3 Kg., two thirds of the mixture and one-third part milk; for a child who weighs more than 3 Kg., three fifths of the buttermeal mixture and two fifths of milk. This diet is indicated for children who fail to gain normally when other milk mixtures are used, for those con-

valescing from contagious disease and for those with marantic conditions. It is contraindicated in alimentary intoxication.

ALIMENTARY INTOXICATION IN INFANTS. L. GONZAGA, Arch. de pediat., Rio de Janeiro **5**:165 (Feb.) 1929.

In the concluding article of this series, the author discusses the treatment. From the dietary standpoint nothing should be given by mouth for from twelve to twenty-four hours, except a cereal water, sweetened with saccharin. Persistent vomiting is easily amenable to gastric lavage. It is necessary to distinguish whether the intoxication is due to an alimentary disturbance or to a gastro-intestinal infection. If there is some definite intestinal irritation, a cathartic is indicated. Dehydration is treated by sufficient subcutaneous injections of Ringer's solution. Hyperpyrexia is controlled by sponging. Blood serum from human beings is also beneficial.

ALKALOSIS. F. GALTES, Bol. Soc. cubana de pediat. **1**:83 (Feb.) 1929.

Galtes believes that the syndrome of alkalosis is seen more often in children than is generally thought. The symptoms are dilated pupils, rapid respiration, circulatory failure and convulsions. It is observed most frequently postoperatively, and in toxic infections. Treatment consists of intravenous injections of calcium chloride and hypertonic sodium chloride. Parathyroid extract-collip is also beneficial during convulsions.

ALKALOSIS FROM ALKALINE THERAPY. T. VALLEDOR, Bol. Soc. cubana de pediat. **1**:96 (Feb.) 1929.

In an experimental study done on animals, Valledor found that alkalosis could be caused by the administration of bases. The alkali reserve of the plasma was augmented, and the total calcium was diminished. Calcium chloride either by mouth or intravenously established a permanent equilibrium.

SANFORD, Chicago.

SUBSTITUTES FOR COD LIVER OIL IN THE PROPHYLAXIS OF RICKETS. I. JUNDELL, Acta paediat. **8**:341 (Dec. 22) 1928.

In carefully organized clinical experiments on sets of twins, whereby one patient is used as a control, it is shown that 1 level teaspoonful of irradiated powdered egg yolk given daily will prevent rickets, while the same quantity of nonirradiated powder is ineffective. The prophylactic dose of irradiated cholesterol, determined in the same way, is from 1 to 2 Gm. daily.

Irradiated ergosterol, given in doses of from 6 to 9 drops a day to six premature infants whose weights at birth ranged from 1,470 to 2,250 Gm., also prevented the development of rachitic changes in the level of inorganic phosphate in the serum and in the x-ray picture of growing bones. It did not prevent the appearance of a more or less marked degree of craniotabes; but in the absence of other evidences of active rickets, the author suggests that this is a physiologic, rather than a pathologic, phenomenon.

SOME HISTOLOGIC ORGANIC CHANGES AFTER COD LIVER OIL MEDICATION. N. MALMBERG, Acta paediat. **8**:364 (Dec. 22) 1928.

For several years Agduhr has called attention to atrophic and generative cell changes in the heart, liver, suprarenal gland and other tissues of experimental animals to which large doses of cod liver oil have been administered. These observations find confirmation in human pathologic changes in the case of the premature infant here described. A girl weighing 845 Gm. at birth was fed almost entirely on breast milk; she was given ½ teaspoonful of cod liver oil twice daily, beginning when she was 3 weeks of age, and 1 teaspoonful twice

daily from the age of 6 weeks to the time of death at 4 months. She gained well during the first three months, but showed stationary weight even in the presence of edema during the fourth month. Histologic examination showed widespread degenerative and atrophic changes in the heart, with extensive connective tissue proliferation which in some places penetrated the entire thickness of the myocardium. In a second patient, who received larger doses of cod liver oil over a much shorter period, similar changes were found, differing from those of the first case only in degree. The rarity of such occurrences suggests that these patients suffered from something of the nature of an idiosyncrasy or diathetic susceptibility, and the author is unwilling, on the evidence at hand, to condemn cod liver oil as a therapeutic agent.

McIntosh, Baltimore.

Avitaminoses of Childhood. Ladislav Kučera, Čas. lék. česk. **65**:422 and 471 (March) 1926.

The author discusses the elements of food involved in metabolism and takes up the question of the deficiencies produced through the lack of the fat-soluble vitamin A, vitamin B (antineuritic), vitamin C (antiscorbutic) and vitamin D (antidystrophic). The question of the etiology of rickets is discussed from the standpoint of vitamin A fraction, antirachitic vitamin, sun light or ultraviolet ray, hygiene and general diet. Before a diagnosis of avitamin dystrophy is made, all other causes of dystrophy including congenital aplasia should be ruled out. The possibility of obscure infantile beriberi with manifestations of vomiting, diarrhea, rapid pulse, dyspnea, aphonia, edema and loss of reflexes is brought out. The usual results are brought out in a series of experiments on pigeons and guinea-pigs fed on various low and avitamin diets.

Stulik, Chicago.

Ergosterol: What It Is and Its Use in the Prevention and Cure of Rickets. H. Franklawa, Pediatria Polska **8**:198 (May-June) 1928.

Ergosterol is a substance found naturally in plants and yeast and can be made artificially by exposing foods to ultraviolet rays. It is a substance which contains vitamin D and is 500 times as potent as cod liver oil. The product is used in the prevention and treatment of rickets, osteomalacia, in pregnant mothers and during lactation to prevent rickets in infants.

Krupinski, Chicago.

Prenatal Conditions

Pseudo-Hermaphroditism. T. Vincent Dickinson, Proc. Roy. Soc. Med. **22**:11 (Dec.) 1928.

A report is made of a case of pseudohermaphroditism in a child born of Italian parents in February, 1928. The birth was premature, and occurred three days before the mother's death from double lobar pneumonia. The child was baptized as a girl, but on examination was found to be a boy, showing a cleft scrotum, hypospadia and undescended testes.

Specimens from a Case of Congenital Deficiency in Abdominal Muscles. Alan Moncrieff, Proc. Roy. Soc. Med. **22**:13 (Dec.) 1928.

The report on the specimens from a case of congenital deficiency in the abdominal muscles is accompanied by a photograph of the patient showing the congenital deficiency and by pictures showing an abnormal condition of the urinary apparatus.

Williamson, New Orleans.

Hemihypertrophia in a Child Three Years Old. Maria Krostoska, Pediatria Polska **8**:304 (Sept.-Oct.) 1928.

About fifty cases of hemihypertrophia have been reported in medical literature, and in some of them the condition was not true hemihypertrophia. The cause of

this condition is not known. Some claim that it is due to developmental defect; others claim that it is due to a defect of the nervous system.

KRUPINSKI, Chicago.

Diseases of the New-Born

IMPETIGO OR PYODERMATITIS NEONATORUM. CHARLES B. REED, Am. J. Obst. & Gynec. **17**:49, 1929.

Reed suggests pyodermatitis contagiosa neonatorum as a better name for the coccal infections of the new-born infant usually designated as pemphigus, impetigo, etc.

He reports an interesting case of a boy born with definite pyodermic lesions on the scrotum from which a pure culture of *Streptococcus hemolyticus* was isolated. The child later developed similar lesions on the scalp and, after twenty-four hours, a large subdural fluctuant mass over the left parietal bone. Two weeks after birth, the lesions had all disappeared.

The author feels that the recurrent epidemics are due to variation in maternal and infant immunity or to changes in the virulence of the infecting organism. He injected a vaccine into a series of forty-eight new-born infants during an epidemic; 80 per cent remained free from infection. Eighty-eight per cent of the control group of twenty-seven private patients observed during the same period became infected.

ALLEN, Chicago.

ANAEMIA AND JAUNDICE IN A NEW-BORN CHILD. HAZEL H. CHODAH GREGORY, Proc. Roy. Soc. Med. **22**:10 (Dec.) 1928.

At the age of 3 weeks, the patient suffered from extreme anemia with jaundice and an enlarged spleen. Subsequently it had a large hemorrhage into the scrotum and passed blood in the feces and urine. Twice, a streptococcus was found in the urine, and the mother was discovered to be suffering from a severe streptococcal pyorrhea. The child was given a polyvalent antistreptococcal serum under the skin, but the injection was not repeated as an enormous hematoma resulted. From that time, recovery began to take place; the spleen diminished in size and the blood count became normal. At 6 months the patient was normal and healthy.

WILLIAMSON, New Orleans.

ASEPTIC PATHOLOGIC CONDITIONS IN THE NEW-BORN INFANT: TEMPERATURE DISTURBANCES. R. WAITZ, Rev. franç. de pédiat. **4**:687, 1928.

In a previous paper, the author stated that cerebrospinal fluid is obtained by spinal puncture in the new-born infant only when pathologic cerebromeningeal lesions are found. With this in mind, he studied forty-seven cases of new-born infants presenting either hyperthermia or hypothermia. The temperature curve in many of these instances resembled that found in the so-called inanition fever of the new-born infant. In 96 per cent of the cases, he obtained cerebrospinal fluid on lumbar puncture. Clinically, these cases were associated with other symptoms indicating cerebromeningeal involvement. In the majority of cases labor had been difficult. In nine cases which came to autopsy, cerebromeningeal lesions were found: four of them were septic and five showed only edema. The suggestions made in this study are extremely interesting, but do not agree with the observations of many of the investigators, who almost always have been able to obtain cerebrospinal fluid by lumbar puncture in the normal new-born infant.

LESLIE, Evanston.

ICTERUS NEONATORUM GRAVIS. J. HAVERSCHMIDT, Nederl. Tijdschr. v. Geneesk. **72**:5406, 1928.

In this article the author gives a clear description of the present knowledge of icterus neonatorum gravis (the history, the morbid picture, complications and the

results of autopsy), and communicates his own experience in five cases of this disease. Two patients recovered. One of these two children was taken to the clinic for a sudden severe hemorrhage from the umbilicus at the age of 16 days. The infant was then still very icteric. Examination of the blood two days later revealed all the symptoms of a severe anemia. The infant recovered slowly. In the author's opinion, this case may be regarded as a rare instance of complete recovery from icterus neonatorum gravis. The history was typical in this case. With the exception of this boy, there was only one child, another boy, alive. The other fourteen pregnancies had terminated in abortions, premature births or stillbirths at term. The mother suffered frequently with albuminuria gravidarum. The parents' Wassermann reactions were always negative, as was the patient's.

The second child who recovered was icteric several hours after birth. On the sixth day of life, it was taken to the clinic with severe icterus. The examination of the blood in this case also showed severe anemia with active regeneration. After three weeks, the icterus began to decrease. The child recovered from the icterus but, as often occurs, symptoms appeared pointing to a disease of the central nervous system. Blindness as a result of neuroretinitis, spastic diplegia and idiocy developed. The Wassermann reaction was negative. The history was typical, as the boy was the only child alive and the two preceding pregnancies had terminated in the birth of a stillborn infant.

Of the three children who died the first died at the age of 22 days. All symptoms, together with the icterus and the anemia, had increased. The results of the autopsy pointed to great destruction of blood, increased production of bile and overflowing of the liver with bile, so that the liver cells, many bile capillaries and blood capillaries were burdened with bile pigments. Large amounts of embryonal blood-forming tissue, especially in the liver, pointed to an attempt at increased blood formation.

In the second child who died, the existence of icterus was observed by the parents only on the third day of life. On the fourteenth day, a hemorrhage from the umbilicus appeared suddenly. After several hours, the patient died. The results of the autopsy were about the same as in the first case. In this case the history was not typical.

The third child who died was taken to the hospital on the eighteenth day of life with a severe icterus, which had been found several hours after birth. There were several hemorrhages and severe anemia, with much regeneration. The icterus increased, and on the twenty-sixth day the child died.

The autopsy in this case gave results similar to those in the other two cases. There were hemorrhages in several organs and much bile pigment in and between the liver cells, also in the dilated bile capillaries. Much bile pigment was also found in the Kupffer cells. A peculiarity in this case was an enormous destruction of liver cells. A myeloid reaction was found in several organs (the liver, spleen and kidneys). The destruction of liver cells found in this case has also been described in other cases of icterus neonatorum gravis. In the author's opinion, this disease and the destruction of the liver cells may be caused primarily by the same factor which caused the large destruction of blood, or secondarily by the engorgement of the liver cells with bile. The third patient who died also had a typical family history.

In conclusion, the author discusses the possible relation between icterus neonatorum gravis and the common icterus of the new-born infant. In this connection, the recent investigations by Lenart and Mitchell on the hemolyzing influence of the mother's blood on that of the new-born infant may be of great value for the explanation of icterus neonatorum gravis. The possible significance of a toxicosis of the mother in causing icterus neonatorum gravis is also pointed out. It is in contradiction to both conceptions that the anemia of the child with icterus neonatorum gravis should be treated by transfusion of the mother's blood.

VAN CREVELD, Amsterdam.

Acute Infections

POSSIBILITY OF ANTIBODY PREPARATIONS IN THE TREATMENT OF EPIDEMIC MENINGITIS. JOSEPHINE B. NEAL, HENRY W. JACKSON, EMANUEL APPLEBAUM and E. J. BANZHAF, J. A. M. A. **91**:1427 (Nov. 10) 1928.

Because of somewhat unsatisfactory results from the use of antimeningococci serum, an antibody preparation was made from the serum. In a general way, the results of its use were favorable, provided a satisfactory preparation was used. The mortality rate of the first twenty-four patients who were adequately treated with the antibody preparation was only 12.5 per cent. Intravenous administration of serum is not advisable except possibly in cases of the septicemic type. Ventricular administration of serum has been unsatisfactory, but three patients so treated with antibody recovered. In several later cases, spinal block cleared up after the administration of the antibody by way of the cistern. The agglutinating titer of the antibody preparations has been much higher than the serum from which it was made. This may not be of much value, however, as it has been observed that the agglutination test does not run parallel with the therapeutic action of the serum. It has been found that after the addition of tricresol the complement fixation is no longer a reliable index. The results with antibody lead to the conclusion that it may be so developed as to be much more effective in the treatment for epidemic meningitis than the serum ordinarily prepared.

INTRADERMAL (INJECTION) VACCINATION. CHARLES ARMSTRONG, J. A. M. A. **91**:1530 (Nov. 17) 1928.

The results of the method of vaccination using multiple pressure have proved successful. This method produces a typical vesicle of maximum firmness, as the epidermis is not removed or destroyed; thus it reduces the chance of accidental infection. By this method the needle is pressed against the taut skin twenty or thirty times through the drop of virus. The virus is then wiped off and no shield is used.

SERUM PROPHYLAXIS IN A MEASLES EPIDEMIC. A. CLEMENT SILVERMAN, J. A. M. A. **91**:1786 (Dec. 8) 1928.

The serum of a patient with measles has its highest titer between the seventh and tenth days after defervescence; after a month, there is gradual diminution of the titer until it reaches a fairly constant level which usually persists for life. The convalescent serum can be shown to have a definite effect on the development of the measles virus in the human organism, this effect varying according to the interval between the implantation of the virus and the injection of the serum. If given before exposure it produces a purely passive immunity, lasting for two weeks or a little more. Injections given early in the period of incubation produce passive immunity and possibly some active immunity, and prevent the measle; the given immunity lasts somewhat longer, possibly for months. If an efficient minimum dose of a potent serum is given within five days of the first exposure, measles may be prevented in the vast majority of contacts. Later administration does not prevent measles entirely, but attenuates the disease. The weight of the patient has a definite bearing on the amount of serum to be given.

Because of the variability of immune serums, pooled serums are advisable. Serum taken a month after the onset of the disease is not as potent as fresh serum, and serum preserved for more than six months may be less effective.

The use of immune serums reduces the incidence of bronchopneumonia and otitis media, and lowers the mortality rate.

BONAR, Salt Lake City.

AGE INCIDENT OF THE COMMON COMMUNICABLE DISEASES OF CHILDREN. S. D. COLLINS, Pub. Health Rep. **44**:763 (April 5) 1929.

The maximum incidence varies from about 3 years for diphtheria to about 8 years for mumps. After the maximum is reached, the rates in every case decline

rapidly as age increases. Some children counted as relatively susceptible because they report no prior attack may be immune to these diseases, and the frequency and intimacy of contact with patients with these diseases may decrease to some extent as age increases. In every instance, the maximum fatality occurs in patients under 1 year of age. The fatality of measles, whooping cough and mumps declines to an almost negligible percentage by 5 years of age, but the decline for scarlet fever and particularly for diphtheria is by no means so great as in the case of the other three diseases.

SANFORD, Chicago.

PRIMARY SUPPURATIVE PSOITIS DUE TO STAPHYLOCOCCUS IN A CHILD TWELVE YEARS OLD. H. L. ROCHER and MALAPLATE, Bull. Soc. de pédiat. de Paris **26**:544 (Dec.) 1928.

A patient with the classic signs and symptoms of primary suppurative psoitis due to staphylococcus was cured by operation.

CLAUSEN, Rochester, N. Y.

CLINICAL REPORT OF ONE HUNDRED AND SIXTY-FIVE CASES OF POLIOMYELITIS IN THE LEIPZIG EPIDEMIC OF 1927. ERICH HASSLER, Monatschr. f. Kinderh. **42**:202, 1929.

A complete report of the epidemic is given, with maps of the city showing the distribution of the cases. Measles seems to have been a predisposing cause. The author then discusses the various clinical types of the disease. In the diagnosis, lumbar puncture was of value. The pressure was sufficiently increased, so that from 20 to 30 cc. of the fluid could easily be removed. The cell count of the spinal fluid was somewhat, but not markedly, increased. The differential counts usually showed from 80 to 90 per cent lymphocytes, but in occasional cases only 50 per cent. Tests for albumin gave weakly positive results; the Pandy test was most reliable, the Nonne test being frequently negative. The author lays considerable emphasis on the sugar content of the spinal fluid as a means of prognosis. Of those having from 0.07 to 0.08 per cent blood sugar in the spinal fluid, that is, 12.6 per cent of the children, the mortality rate was 9.5 per cent. Of those with from 0.08 to 0.09 per cent sugar in the spinal fluid, that is, 7 per cent of the children, the mortality was 46 per cent. Among those with from 0.09 to 0.1 per cent sugar, that is, 2.4 per cent of the children, the mortality was 50 per cent. Those with sugar in the spinal fluid of more than 0.1 per cent, comprising 2.0 per cent of the children, had a mortality of 100 per cent.

The high values for sugar did not necessarily occur in the children with the extreme paralyses, or in those with the greatest meningeal symptoms or the highest cell counts.

The Wassermann reactions were uniformly negative.

The blood count was extremely variable. It ranged from a slight leukopenia to 20,000 or more. In some cases there was an increase in polymorphonuclears; in others, an increase in lymphocytes.

The therapy was, of course, unsatisfactory. Lumbar punctures gave symptomatic relief, but by no means in all cases. In no case did lumbar puncture prevent paralysis. Chemotherapy in the form of trypaflavine was useless. The author was also disappointed in the use of convalescent serum, although he did get the impression that Pettit serum aided in a few cases.

The writer thinks that the disease is spread by human beings.

THE TREATMENT OF TETANUS IN CHILDHOOD. PAUL HEIM, Monatschr. f. Kinderh. **42**:251, 1929.

The author reasoned that the muscular spasm in tetanus caused an increased production of lactic acid. This, in turn, would cause an increased muscular rigidity. To avoid this factor, he gave intravenous injections of from 20 to 50 cc. of a 10 per cent solution of sodium bicarbonate and from 10 to 30 Gm. by mouth. This treatment caused an immediate cessation of the muscular rigidity and enabled the patients

to move their legs slightly, but did not affect the trismus. In from six to ten days, however, the patients were able to feed themselves. In the last two years, Heim has treated nine patients in this way; of these, only two died, one on the first and one on the third day after admission. He also used antitoxin.

INTERMITTENT FEVER AND CHILLS IN CHILDREN. H. KLEINSCHMIDT, Monatschr. f. Kinderh. **42**:297, 1929.

In this clinical study, the author concludes that there is no fever characteristic of sepsis. There is no foundation for the idea that intermittent fever is due to either sepsis or pyemia, although sepsis is usually accompanied by intermittent fever. This type of fever occurs also in pyuria, grip, lymphadenitis, otitis, sinus thrombosis, pneumonia, tuberculosis and cholangeitis.

Chills may occur from the first to the second year. They are a sign of bacterial invasion of the blood, but are not necessarily indicative of sepsis. Nevertheless, during childhood they occur most frequently in sepsis and are of considerable diagnostic value.

WHEN IS SCARLET FEVER CONTAGIOUS? R. WEIGERT, Monatschr. f. Kinderh. **42**:469, 1929.

From a clinical study, the author concludes that scarlet fever is not contagious in the incubation period. During the stage between the first symptoms and the appearance of the exanthem, the disease is mildly contagious, but not nearly so much as in the stage immediately following the exanthem. Inanimate objects play a greater rôle in spreading the disease than is usually thought. The author suggests that these clinical observations be checked up by bacteriologic studies.

GERSTLEY, Chicago.

DISCOVERIES OF DI CRISTINA IN REGARD TO SCARLET FEVER. A. DOSKOCIL, Čas. lék. česk. **65**:554 (April) 1926.

The author reviews the work of Di Cristina on the diplococcus of scarlet fever and cites the contemporary confirmatory work of other Italian workers. Di Cristina inoculated 150 children with an attenuated culture of these organisms, and in spite of institutional exposure only 3 cases of scarlet fever developed. In another group of 40, in which exposure was definite, only 1 case, or 2.5 per cent, developed. The author was not able to verify the presence of the diplococcus in the blood, ascites cultures, anaerobic cultures, throat or centrifugated urine cultures in a series of sixteen cases of scarlet fever, using, however, a modified anaerobic technic. He thinks that the material used by Di Cristina as an attenuated culture may have been a culture containing only a few virulent organisms, which were, however, of sufficient number to produce immunity.

STULIK, Chicago.

HOW LONG IS SCARLET FEVER CONTAGIOUS? J. BOGDANOWICZ and W. SZANAJCH, Pediatria Polska **8**:1 (Sept.-Oct.) 1928.

The patient is not necessarily free from contagion from six to eight weeks after the onset of the disease. This has been proved by European and American investigators. Bogdanowicz and Szanajch set special rules after experimenting with scarlet fever at the Karol and Maryja Hospital at Warsaw. The patients are isolated in small groups. Every hygienic precaution is observed. The convalescent patients are isolated according to the severity of their symptoms and the presence of bacteria in the throat and nose. The patient is allowed to leave the hospital when *Streptococcus hemolyticus* is not found in the throat and nose and when the urine is normal. All patients that leave the hospital must remain at home for two more weeks. In patients with complications, the period of isolation is much longer. All children must receive the Dick test, and those that give a

positive reaction should receive antitoxin. The method is not absolutely protective but is encouraging.

DIAGNOSIS AND TREATMENT OF HEINE-MEDIN DISEASE. Z. BYCHOWSKI, Pediatria Polska **8**:180 (May-June) 1928.

The main points in the diagnosis are: the condition should be differentiated from tuberculous meningitis and polyneuritis. Heine-Medin disease occurs during the summer and fall and meningitis in the spring. "Herpis Oris" is common in meningitis, while it is absent in Heine-Medin disease. Elevation in temperature in Heine-Medin disease lasts for only a few days, while in meningitis it lasts for a long time. Paralysis of the cranial nerve occurs often in meningitis but only seldom in Heine-Medin disease. The spinal fluid in meningitis is cloudy and many white blood cells are present, while in Heine-Medin disease, the fluid is clear. In polyneuritis paralysis spreads and lasts for a long period, while in Heine-Medin disease, it lasts only a few days. The pain in polyneuritis is severe, while in Heine-Medin disease it is not so great.

Treatment is still a subject of discussion; some use methenamine, and Netter, in 1910, began to use from 10 to 15 cc. of human convalescent serum injected intraspinally after removing an equal amount of spinal fluid. The results were good, but it was hard to secure this serum. Pettite of the Pasteur Institute began to use horse serum subcutaneously, intravenously and intraspinally with fair results. In Italy and France the use of x-rays to the spinal cord and diathermy to the muscle gave good results, but these procedures are costly. Bychowski uses massage, electricity, sun baths and active and passive motion with which he obtains promising results.

IMPORTANCE OF WIDAL REACTION IN SEVENTY-SEVEN CASES OF TYPHOID FEVER. JULIAN KAPLANSKI, Pediatria Polska **8**:169 (May-June) 1928.

Kaplanski obtained the following results with the Widal reaction: During the first week of the disease the reaction was positive in 50 per cent of the cases; during the second week, in 82 per cent and during the third week, in 91 per cent.

He claims, however, that in mild forms of the disease the reaction may be negative and that in severe forms the reaction becomes positive late. A negative Widal reaction does not mean absence of disease.

B. COLI INFECTION IN THE KNEE JOINT OF AN INFANT 9 MONTHS OLD OCCURRING AFTER A FALL. JOSEPH KON, Pediatria Polska **8**:177 (May-June) 1928.

The peculiarity of this infection was that it responded only to quartz light, autovaccine and Bier's hyperemia.

USE OF 40 PER CENT METHENAMINE SOLUTION IN SEVERE CASES OF TYPHOID. STEFANJA KRUSCHE, Pediatria Polska **8**:300 (Sept.-Oct.) 1928.

Twenty-three patients with typhoid of a severe type were treated by intravenous administration of methenamine daily. The results were amazing, particularly in regard to the general condition of the patient. Complications were unknown in these cases and in only one case was irritation of the bladder noted. The drug, however, had no effect on the duration of the disease or on the curve of temperature.

KRUPINSKI, Chicago.

HEREDITARY SYPHILITIC MENINGITIS. H. ESCHBACH, Paris méd. **9**:217 (May 2) 1929.

A child, aged 3 years, who had walked without difficulty, suddenly was unable to walk without support and complained of dizziness. This attack was followed by irritability, insomnia and nervousness. A spinal puncture gave 800 lymphocytes and a positive Wassermann reaction. The child recovered rapidly after the

administration of arsenicals. The author believes that vertigo is an early and constant symptom of syphilitic meningitis.

ULCERATIVE CASEOUS TUBERCULOSIS IN AN INFANT. A. CASTELLANOS, Bol. Soc. cubana de pediat. **1**:59 (Feb.) 1929.

A child, aged 10 months, had been rather indifferently isolated from her mother who was under treatment for tuberculosis. At this time, she began to have an afternoon temperature of 40 C. (104 F.) and showed considerable loss of weight. Clinical examination and a roentgenogram showed an involvement of the entire left lung. Autopsy showed a massive ulcerative caseation.

A NEW INTRADERMAL TUBERCULIN TEST. B. TRAMBUSTI, Boll. d. Ist. sieroterap. milanese **7**:371 (July) 1928.

Trambusti used an intradermal solution of old tuberculin, similar to that used in the Pirquet test, in 5 per cent phenol solution. The Pirquet reaction elicited positive reactions in 9.7 per cent and negative reactions in 88.2 per cent of 634 cases, the Mantoux test was positive in 33.1 per cent and negative in 62.9 per cent, while Trambusti's produced positive reactions in 33.2 per cent and negative in 62.2 per cent.

SANFORD, Chicago.

THE INHERITANCE OF SYPHILIS. R. MATZENAUER, Wien. klin. Wchnschr. **42**:2, 1929.

Twenty-five years ago, the author raised a storm of antagonistic discussion by asserting his belief that the transmission of syphilis from father to child is unproved, and that congenital syphilis is invariably acquired from a syphilitic mother. Careful search of the literature has failed to reveal a single exception to Colles' law. The application of the Wassermann reaction and the demonstration of spirochetes in the lymph nodes and maternal portions of the placenta afford convincing evidence of the truth of Matzenauer's thesis.

IS THE IMPOSSIBILITY OF THE DIRECT TRANSMISSION OF SYPHILIS FROM THE FATHER TO THE FETUS UNPROVED? J. ALMKVIST, Wien. klin. Wchnschr. **42**:97 (Jan. 24) 1929.

Among sixty-seven mothers who gave birth to syphilitic children, five had no knowledge of having had the disease and showed no clinical or serologic evidence of it. One patient was examined only once; two patients were examined three times for more than a month; one was examined seventeen times in the course of fifteen months, and one was examined thirty-six times during fourteen years. The last patient finally married again, and had a normal child. (Unfortunately, the author does not record data concerning the fathers of the syphilitic children.) The author proposes that mothers of syphilitic children, who themselves show neither clinical nor serologic evidence of syphilis, be observed and not treated, in order that data may be obtained.

IS THE STRAIN B.C.G. A "VIRUS FIXÉ"? F. SCHWEINBURG, Wien. klin. Wchnschr. **42**:164 (Feb. 7) 1929.

The author objects to the assertion of Kraus of Vienna that B.C.G. is a "Virus fixé" (V.) such as that of rabies. B.C.G. resembles the virus fixé only insofar as it does not revert to the original type, and differs in all other properties. B.C.G. is avirulent, while V. is virulent; B.C.G. produces lesions, and must do so if it is to confer any degree of immunity; V. is and must always be nonpathogenic in its therapeutic application. B.C.G. in the nonviable state is without effect, whereas in the nonviable state V. can produce immunity. The virulence of V. can readily be enhanced, while that of B.C.G. cannot experience an increase.

(Petroff's observations to the contrary need confirmation.) The incubation period in the case of V. is fixed and independent of the dose; in the case of B.C.G., this can scarcely be true.

CLAUSEN, Rochester, N. Y.

PROLIFERATIVE FORMS OF TUBERCULOSIS FOLLOWING VACCINATION WITH B. C. G. N. J. SPYROPOULOS, Acta paediat. **8**:315 (Dec.) 1928.

A report is given of four infants who received B. C. G. during the first days of life. The first patient died at 18 months of age of tuberculous meningitis; the diagnosis was confirmed by the finding of organisms in the spinal fluid. At 10 months of age the second patient showed a positive Pirquet reaction and on roentgen examination a widespread tuberculous involvement of the lungs. The child died a few days after the examination. There was no confirmation of the diagnosis at autopsy. Both of these patients had been in a tuberculous environment. While the author does not ascribe their infection to the vaccine, he admits that it failed to prevent a fatal invasion. The third patient died at 5 weeks of age with a positive Pirquet reaction and a meningitis the nature of which was not determined by lumbar puncture. The fourth showed, at 4 months of age, a positive Pirquet reaction and on roentgen examination a bronchial gland tuberculosis; an enlarged cervical lymph node removed surgically showed extensive caseation. Since in the case of the last two patients inquiry failed to disclose any history of tuberculous contact, the author is inclined to put the blame on their vaccination with B. C. G.

MCINTOSH, Baltimore.

DIFFICULTIES IN DIAGNOSING TUBERCULOUS MENINGITIS IN THE YOUNG CHILD. J. H. G. CARSTENS, Nederl. Tijdschr. v. Geneesk. **72**:6139, 1928.

In this article the author discusses the many difficulties which one may encounter in diagnosing tuberculous meningitis. The younger the child the more the prodromal symptoms of tuberculous meningitis may be absent or less clear. Also, the younger the child the smaller is the resistance to the tuberculous infection and the greater is the possibility that the tuberculous meningitis may develop in an acute or subacute way. In infants the course of the disease often resembles that of acute toxicosis, which causes the child's death before the typical neurologic symptoms can develop. This does not make the diagnosis easier. Several atypical forms of the disease occur in children. The author describes these several forms (the typhoid, the apoplectiform, the atactic hemiplegic, the toxic or the somnolent and the eclamptic) and gives some clinical illustrations of each. The type is often mixed. The value of several symptoms given as typical is discussed. In very young children, diarrhea often exists instead of constipation.

Measles, whooping cough and influenza may cause the activation of a latent tuberculosis. The beginning of tuberculous meningitis, however, may be like that of influenza, in that the inflammation of the meninges causes a disturbance of the circulation at the base of the skull, and this may give rise to redness of the pharynx, the ear drum and other organs. Also, suppurating nontuberculous otitis media and inflammation of the surrounding bone may exist in the beginning of tuberculous meningitis. A morbid picture closely resembling tuberculous meningitis may be given by meningo-encephalitis or meningitis serosa of different etiology (especially from influenza, typhoid fever, paratyphoid fever, lobar pneumonia, pyelonephritis and enterocolitis). Some points in the history may help, but in many cases only the examination of the cerebrospinal fluid helps one to make a correct diagnosis.

THE PROGNOSIS OF TUBERCULOSIS IN CHILDREN. G. J. HUET, Nederl. Tijdschr. v. Geneesk. **72**:6151, 1928.

In 1920 it was found that of 271 children in Amsterdam who had been nursed in the Amsterdam Sanatorium for Children — Hoog-Blaricum — between 1912 and 1918, 67.9 per cent were in a fairly good condition, 23.7 per cent were in a bad

condition, whereas only 8.4 per cent had died. In this article, the author relates what became of 1,267 children taken into the sanatorium from 1919 till the end of 1926. He divides his patients into several groups. The best results were obtained in cases of peritonitis (nineteen of these patients are in a good or very good condition now), and also in pleuritis (93.1 per cent of seventy-two patients were in very good or good conditions in 1928), and in patients with primary foci (90.3 per cent of sixty-two patients are in good or very good conditions). It is interesting to note that in the severe cases of pulmonary tuberculosis with disseminated processes the results were for the greater part good. The patients with tuberculosis of the bones and joints, especially those with spondylitis, showed a large mortality. Two after-investigations have since been made of the patients nursed in the sanatorium between 1919 and 1923, with a free period of two years. Contrary to what might have been expected, the condition had not become worse at the second investigation, or else was only a little worse. An exception has to be made in the case of severe diseases of the lungs and in progressive cases; however, even in these cases, the results are not so bad. If this latter group of patients is excluded, one may say that the condition is only slightly worse. In the majority of the patients, the condition remains good or even becomes better in the course of years. Therefore, the author is inclined to accept the view that tuberculosis of the adult does not develop directly from the tuberculosis of childhood by a steady decline. Further investigation is necessary for the after-investigation of these patients lasts only for four years; so that the final result may be still poorer. From the results so far obtained, however, the conclusion may be drawn that the manifest tuberculosis of childhood in a large majority of cases gradually subsides after many years.

SYPHILIS CONGENITA. J. W. VAN DER VALK, Nederl. Tijdschr. v. Geneesk. **73**:290, 1929.

In this clinical lecture, the author discusses two children suffering from an uncommon form of syphilis congenita. In the first patient, the symptoms of congenital syphilis were observed at the age of 3½ weeks. The child received antisyphilitic treatment and remained in a good condition until the age of 3 years. At this age, after a period with vague symptoms and complaints but no fever, the child suddenly developed hemiparesis. Encephalitis acuta and cerebral embolus could be excluded. It was probable that a syphilitic condition of the blood vessels caused the hemiplegia. Two months later, during which time the child was treated with iodine, mercury and an arsphenamine preparation, she suddenly developed high fever, and symptoms of meningitis appeared. The Wassermann reaction of the spinal fluid was + + + +.

The second patient was a girl, aged 12 years, from a syphilitic family. She had no syphilitic symptoms, but the Wassermann reaction was + + +. She was treated principally with neoarsphenamine for about one and one-half years. The Wassermann reaction fell from + + + to +. Three months later the reaction was + +, and after another month, + + +. She then complained of headaches, dizziness and drowsiness. The development of a syphilitic meningitis was feared by the author. An investigation showed that the patellar and achilles reflexes were increased and that the pupils did not react. Further, she had choroiditis, as occurs in syphilis congenita. It was feared that the nonreacting pupils and the three subjective symptoms pointed to a beginning tabes dorsalis. A new examination of the spinal fluid confirmed the diagnosis of tabes. As the patient had already received intensive treatment with arsphenamine, the author began a malarial treatment after he had convinced himself that she could bear quinine. Eight days after the intramuscular injection of 3 cc. of malarial blood, the patient had the first chill and an elevation of temperature which reached 40.4 C. (104.7 F.). She had twelve of these elevations, the highest being 41.4 C. (106.5 F.). After the eleventh attack of fever, quinine hydrochloride was given. The patient reacted promptly after the treatment with quinine, with disappearance of the fever. A new lumbar puncture showed that the Wassermann and Nonne

reactions had decreased greatly after the malarial treatment, and that the number of cells was reduced to normal. It is the author's intention to try to complete the patient's treatment by giving a mixed course of neoarsphenamine and bismuth preparations.

VAN CREVELD, Amsterdam.

SIGNIFICANCE OF THE MANTOUX TEST FOR TUBERCULOUS MENINGITIS. L. LUKASIEWICZ, Pediatria Polska **8**:121 (March) 1928.

Lukasiewicz found that the Mantoux test was most reliable in his forty cases; however, in only 80 per cent of these cases were positive reactions obtained. The highest percentage of negative results was found among girls and in patients in the last week of life. Cases were checked up either by autopsies or by the discovery of Koch's bacilli.

DIFFERENTIATING POINTS IN TUBERCULOUS MENINGITIS. T. MOGILNICKI, Pediatria Polska **8**:132 (March) 1928.

In his cases of tuberculous meningitis, Mogilnicki found the important differentiating point to be dermographia. This dermographia appears gradually, becomes intensive and is present longer than that found in other diseases. Another important point is the sunken abdomen; however, the author found that, in his cases, the abdomen became distended five days before death and marked peristaltic movement of the intestines could be seen. He explained the phenomenon by saying that some segments of the intestines become paralyzed and others do not, which produces relaxation and contraction. Another point of importance is the so-called "gun trigger" position of the child (Enchien Defusil).

KRUPINSKI, Chicago.

Internal Diseases

1. CONGENITAL SHORT-NECK. 2. TUMOR OF RIGHT SIDE OF NECK (?) TERATOMA. ERIC PRITCHARD, Proc. Roy. Soc. Med. **22**:130 (Dec.) 1928.

1. Congenital short-neck was reported in a girl, aged 1 year and 8 months. The patient had a right facial paralysis, and there was a congenital nodule on the right cheek. The report is accompanied by a roentgenogram.

2. A tumor of the right side of the neck was reported in a girl, aged 4 years. In October, 1927, she was taken to the hospital because of a swelling on the right side of the neck. A provisional diagnosis of cystic enlargement of the thyroid or the thymus was made. In May, 1928, she returned to the hospital. The swelling had completely disappeared, but the patient had a slight cough. A fulness was found above the right clavicle. On percussion, there was extreme dulness over the upper two thirds of the chest. Posteriorly, there was complete dulness to the level of the sixth dorsal spine with muffling of the breath sounds.

A roentgenogram showed dense circumscribed opacity over the area of dulness. Later, the child was admitted as an inpatient with the diagnosis of sarcoma of the lung. In June, she was sent to the hospital for treatment with radium. On October 6, the general condition was still satisfactory. There was a slight cough with blood-stained sputum. The right arm was somewhat swollen. A roentgenogram showed no change. The results of a tuberculin test were negative. The Wassermann reaction was weakly positive. The blood count showed: hemoglobin, 80 per cent; red blood cells, 4,680,000, and white blood cells, 7,300.

RENAL DWARFISM. DONALD PATERSON, Proc. Roy. Soc. Med. **22**:142 (Dec.) 1928.

The foregoing case was reported in a boy, aged 10 years, who weighed 24 pounds (10.9 Kg.) and was 35 inches (89 cm.) high.

1. Two Cases of Fibrocystic Disease of Bone. 2. Late Result in Case of Suppurative Arthritis of the Knee, Treated by Transverse Subpatellar Incision and Secondary Suture. C. Jennings Marshall, Proc. Roy. Soc. Med. **22**:144 (Dec.) 1928.

1. Both of the patients with fibrocystic disease of the bone were admitted to the Victoria Hospital for Children. One, aged 8 years, was admitted on account of spontaneous fracture of the humerus. The roentgenographic report read "revulsion of the greater tuberosity of the humerus: cystic appearance of the upper end of the humerus."

The second patient, aged 5 years, was admitted because of pain in the left hip, which was stated to have been twisted twelve days previously. The roentgenogram showed a marked cystic condition of the left femur from the level of the epiphyseal line to the lesser trochanter.

Both patients were operated on, and details of the operations are given in the report.

2. This case was reported in a girl, aged 8 years.

Williamson, New Orleans.

Plastic Serpiginous Peritonitis. Morquio, Arch. de méd. d. enf. **31**:204, 1929.

The author has added two cases to a series of four reported by him in 1919, illustrating a variety of peritonitis that occurs in childhood which is different from other types, running a subacute course and terminating in recovery. Of variable origin, these cases assume the purely plastic form, with both deep and superficial accumulations throughout the peritoneal cavity and with alternating periods of hyperpyrexia and normal temperature. Functional disorders are frequent; the duration of the disease in Morquio's cases was from three to four months. One of these was in a girl, aged 12, suffering from typhoid fever of the fulminating type. On the fifth day, there were severe intestinal hemorrhages and on the twentieth day, a perforation was diagnosed, followed by the usual collapse and general peritonitis. Operation was discussed but was not considered advisable on account of the patient's profound asthenia. For the next two weeks the condition continued critical, but with beginning convalescence, plastic exudates of varying size and consistency appeared throughout the peritoneal cavity; there was intense colic and severe vomiting at intervals for two months, when a regressive phase ensued and the patient went on to complete recovery. Six years later, the child was examined and found in perfect health. In another instance, this syndrome was provoked by trauma of the abdomen and followed the same tedious course.

Amesse, Denver.

Subphrenic Abscess in an Eight Year Old Child. A. Aballi, Bol. Soc. cubana de pediat. **1**:74 (Feb.) 1929.

A girl, aged 8 years, had a fever with vomiting and abdominal pain. There was a small palpable mass under the border of the liver. An examination of the blood showed 16,000 leukocytes, with 82 per cent polymorphonuclears. A roentgenogram revealed a subphrenic abscess. As there was no history that might have led to a suspicion of this, the author advocates the taking of roentgenograms in all obscure abdominal conditions.

Sanford, Chicago.

Allergy of the Life-Cycle. C. Pirquet, Wien. klin. Wchnschr. **42**:65 (Jan. 17) 1929.

The term allergy, as proposed in 1906 by Pirquet, has meant an altered mode of reaction due to the contact of the organism with any sort of outside influence. In recent years, the author has turned his attention to alterations of reaction due to spontaneous changes within the organism. For example: The initial infection

with tuberculosis causes a similar reaction at all ages, but the secondary stage is strongly influenced by age. The infant tends to develop miliary tuberculosis; the 3 or 4 year old child, scrofula, and the school child in general, no secondary extension. The tertiary sfage tends to develop in poorly nourished adolescents. Likewise, the manifestations of syphilis are strongly influenced by age. Age allergy is notable also in the rheumatic cycle. Chorea, arthritis and endocarditis appear rather suddenly at the end of the third year of life; arthritis and chorea have their maximum frequency between the tenth and the fifteenth year. Are these secondary manifestations to some as yet unknown primary infection occurring at an earlier age?

HYPERTENSION AND BREATHING. LOTHAR TIRALA, Wien. klin. Wchnschr. **42**:137 (Jan. 31) 1929.

The author's experience is confined to adults with hypertension. By means of deep breathing for a few minutes, the elevated blood pressure is caused to fall several centimeters of mercury. By the repitition of the process, a more lasting fall can be brought about than by the use of drugs.

AGRANULOCYTOSIS IN INFANCY. NIKOLAUS CHRISTOF, Wien. klin. Wchnschr. **42**:335 (March 14) 1929.

Two weeks after recovery from severe pyodermia, a boy, aged 3 months, again developed an infection of the skin suggestive of chickenpox. At this time, a smear of the blood showed: no polymorphonuclear neutrophils; 1 per cent eosinophils, 76 per cent lymphocytes, 22 per cent monocytes and 1 per cent myelocytes. (The total white cell count is not mentioned.) The red cells and the platelets were normal. There was no membrane on the tonsils. One week later, eosinophils and polymorphonuclears appeared in the blood. Recovery, complicated by the development of an axillary abscess, was complete. From the skin and from the abscess, the author obtained a streptococcus, which he did not identify, but which he thinks is responsible for the agranulocytosis.

CLAUSEN, Rochester, N. Y.

GASTRIC AND DUODENAL ULCERS IN CHILDREN. N. BERGLUND, Acta paediat. **8**:323 (Dec. 22) 1928.

The case reported is given in some detail of a boy, aged 8 months, who, after four days of mild gastro-intestinal symptoms, suddenly went into collapse and passed large amounts of blood by rectum. Exploratory laparotomy failed to disclose the cause of bleeding, and he died two days later in severe anemia. Autopsy showed a duodenal ulcer.

In an analysis of the records of three hospitals, comprising 1,323 necropsies in children up to 13 years of age, the author encountered reports of 14 cases of duodenal ulcer, 4 of gastric ulcer and 1 of both types. Fourteen cases, including either type, occurred during the first year of life.

MCINTOSH, Baltimore.

TREATMENT OF PNEUMONIA IN CHILDREN. LERNER, Pediatria Polska **8:1** (May-June) 1928.

During three years of observation and treatment with different methods at St. Ann's Hospital at Lodz, Lerner comes to the conclusion that the quinine treatment is the best because it reduces the mortality and shortens the duration of the disease because of the bactericidal action of quinine on pneumococci. He uses 10 per cent quinine and 5 per cent ethyl carbamate (urethane), in injections given every second day.

BRONCHIAL ASTHMA IN CHILDREN. W. KWASKOWSKI, Pediatria Polska **8**:289 (Sept.-Oct.) 1928.

Since 1910, according to Eppinger and Hess, the theory of vagatonia has been supposed to solve the problem of asthma. Much work has been done on the nerve supply of the respiratory organs, but not much has been accomplished. Kwaskowski claims that laryngospasm in children is closely related to bronchial asthma. The foregoing conditions are associated with vagatonia and mineral imbalance in the body of such minerals as potassium and calcium. The best remedies for the relief of asthma are epinephrine, solution of pituitary or atropine.

KRUPINSKI, Chicago.

Nervous Diseases

UNILATERAL NEUROFIBROMATOSIS OF THE CRANIAL AND DEEP CERVICAL NERVES: REPORT OF A CASE. GEORGE T. PACK, Arch. Neurol. & Psychiat. **21**:919 (April) 1929.

A boy, aged 11, complained of an overgrowth of the left side of the face, pain and partial blindness in the left eye and daily vertigo. Examination showed a marked exophthalmos of the left eye. The pupil was dilated and did not react to light or in accommodation. There was almost complete blindness of the left eye, while vision in the right was normal. The general musculature of the patient was weak and adynamic. The left side of the thorax, the left scapula, the left pectoral muscles, left leg, left arm, left hand, etc., were considerably smaller than the same structures on the right side. The left arm was much shorter than the right. The left hand had a weaker grip. There was a compensatory scoliosis, attributable to differences in the lengths of the lower limbs and to differences in muscle strength of the two sides of the trunk.

A roentgenogram of the skull showed that the left orbit was smaller than the right. The left antrum was abnormal in size and location. In the anterior cranial fossa and anterior to the sella turcica was a rather deep excavation. Several unerupted teeth were observed. A section from the neck showed that the local interstitial proliferation of fibroblasts (neuroglia element?) constituted the major portion of the tumor and dissociated the nerve fibers.

The author concludes that the changes in bone observed in this patient may be caused by or coincidental with the neurofibromatosis. This is particularly indicated in the disparity in the size of the right and the left sides of the skull. Changes in bone occasionally accompany this disease.

SANFORD, Chicago.

CRANIAL MENINGITIS, PNEUMOCOCCIC IN ORIGIN. P. CORCAN, Rev. franç. de pédiat. **4**:780, 1928.

Two cases of pneumococcic meningitis occurring in infants 4 months old are reported, in which autopsy revealed a thick fibrinopurulent exudate, rich in pneumococci, over both cerebral hemispheres, although lumbar punctures forty-eight and thirty-six hours before death had yielded normal cerebrospinal fluid. The fluid at the time of autopsy also appeared normal, and no adhesions were present. The authors think that the process remained localized because of the fibrinous character of the exudate and that the nonliquefaction of the exude sufficed to explain the lack of pathologic changes in the cerebrospinal fluid. Such a condition renders diagnosis difficult, particularly as the symptoms are not classic; there may be prostration or extreme agitation with hypertonicity. Marfan suggests the possibility of subarachnoid puncture, the needle being inserted at the external angle of the anterior fontanel and being directed toward the coronal suture.

LESLIE, Evanston.

BABINSKI PHENOMENON AND ASSOCIATED REFLEXES IN INFANCY. M. de BRUIN, Acta paediat. **8**:277 (Dec. 22) 1928.

A study was made of various foot responses in a group of 194 patients, most of them young infants, and the well known frequency of a positive Babinski sign

was confirmed. Definite athetoid movements cease to appear by the end of the fourth month of life. The author discusses the relationship of associated types of reflex to the Babinski phenomenon, and concludes that as yet no satisfactory explanation of the presence of these signs in infants and their disappearance later in childhood has been offered.

McIntosh, Baltimore.

Course and Treatment of Chorea. L. Iwaszkiewicz, Pediatria Polska **8**: 304 (Sept.-Oct.) 1928.

In fifty-four cases of chorea, 75 per cent occurred in girls. The age was from 9 to 15 years. People are more predisposed to the condition during the winter. In 50 per cent, endocarditis with systolic murmur was found; in 19 per cent, rheumatic pains occurred. The course of the disease is from three weeks to two and one-half months. All of the patients were treated by intravenous injection of a mixture of methenamine, sodium salicylate and caffeine sodium salicylate. The symptoms usually completely subsided after the eighth injection. In prolonged cases the use of milk or sulphur suspension intramuscularly gave good results; bromides, chloral hydrate, U. S. P., phenobarbital and potassium arsenite were also used in conjunction with the foregoing treatment.

Blood Analysis in Twenty-Two Cases of Chorea. Bialaszewicz, Pediatria Polska **8**:316 (Sept.-Oct.) 1928.

Bialaszewicz found secondary anemia, leukocytosis, eosinophilia and lymphocystosis in almost every case of his series.

Case of Chorea After Attack of Rheumatic Fever. Jacob Polakow, Pediatria Polska **8**:320 (Sept.-Oct.) 1928.

After thorough study and observation, Polakow claims that rheumatic fever and chorea have a close relationship.

Kidney Complications in Chorea. Bronislaw Frenkiel, Pediatria Polska **8**:321 (Sept.-Oct.) 1928.

Frenkiel found that the kidneys are frequently affected in chorea and bases his opinion on the fact that chorea is an infectious toxin-producing disease.

Pathogenesis of Chorea. Bronislaw Frenkiel, Pediatria Polska **8**:322 (Sept.-Oct.) 1928.

Many of the mysteries of chorea are still unsolved.

It is known, however, that chorea occurs mostly in girls from 5 to 16 years of age, that it is usually found in children of neuropathic tendencies and that it often occurs during infectious diseases. Negroes and Indians are usually immune. The most common complication is disease of the heart. In 92 per cent of the cases of chorea the disease is associated with rheumatic fever. It is difficult to say that chorea belongs to the group of infectious diseases because the micro-organism does not satisfy Koch's postulates.

From observation and experimentation of many American and European workers, the conclusion is reached that chorea is an infectious toxin-producing disease in which different strains of streptococci and staphylococci are found. Purkinje's cells in the globus pallidus, often in the substantia nigra and the cells of the neostriatum. It is not an inflammatory process but causes disturbances of the brain. Treatment is therefore symptomatic and consists of general supportive and foreign protein therapy and sedatives.

Krupinski, Chicago.

Diseases of the Eye

A Trachoma Survey of 29 Public Schools on or Near Indian Reservations in Montana. J. H. Crouch, Pub. Health Rep. **44**:637 (March 22) 1929.

The presence of Indians with trachoma in the community is a necessary factor in the appearance of trachoma among white school children in Montana. Contact at home is an important factor in the spread of trachoma. Contact in school is not important.

Sanford, Chicago.

Diseases of the Ear, Nose and Throat

Otitis Media in Children. Michalowicz, Pediatria Polska **8**:296 (Sept.-Oct.) 1928.

Sometimes otitis media presents a serious problem because infants are unable to tell their symptoms, and often the first sign of the condition is the discharge. This symptom occurs late in children because the drum is strong and thick, and by the time it is discovered a serious damage is done to the ear. Michalowicz advocates examination of the ears of every child, and as soon as diagnosis is made, paracentesis should be done.

Krupinski, Chicago.

Diseases of the Skin

Clinical Aspects of Certain Problems Relating to Herpes Zoster. A. Wallgren, Acta paediat. **8**:241 (Dec. 22) 1928.

Two girls, aged 5 and 3 years, respectively, occupied adjacent beds in a tuberculosis ward. During convalescence, and while afebrile, they simultaneously broke out with herpes zoster which involved the right side of the chest, the same side on which both patients showed tuberculous bronchial lymph nodes by roentgen examination. There were five patients in this ward who had not previously had chickenpox: the two patients just described and three others. In two weeks the latter developed varicella, while the girls who had had herpes zoster remained free. There had not been a case of varicella on the service for several months.

This situation brings up the questions of the relationship between herpes zoster and varicella, and that between tuberculosis and zoster.

The author gives clinical abstracts of eight cases in which herpes zoster appeared in children who had not had chickenpox, and was followed after an interval of from sixteen to twenty-one days by definite chickenpox in susceptible contacts, the patients with zoster remaining apparently immune to chickenpox. From 1922 to 1927, he saw eleven cases of herpes zoster; of these, four cases (included among the eight just mentioned) bore a suggestive etiologic relationship to varicella; two of the patients had previously had varicella, while the remaining five, although they had not had varicella and although contact with patients susceptible to varicella was deliberately encouraged, failed to show any relation to the latter disease. After reviewing the literature on this nosologic association, the author concludes that there is no single etiologic factor for herpes zoster but that certain cases, doubtless rare, are caused by the virus of chickenpox.

In the great majority of the cases of herpes zoster which Wallgren has seen, there has been an associated tuberculous condition. In fact, in 70 per cent, the distribution of the eruption corresponded to the location of the tuberculous process not only in regard to the right or the left side but even in regard to the level of the sensory roots involved. He believes that the tuberculous process in some unknown way, probably by a disturbance of circulation, produces in the adjoining root ganglions a locus of lowered resistance in which a circulating toxin, sometimes the virus of chickenpox and sometimes otherwise, may gain a foothold and give rise to the clinical picture of herpes zoster. The part which tuberculosis plays is thus not a specific one, but is prominent simply because of its relative frequency as the basis of visceral disease.

McIntosh, Baltimore.

REPORT OF EIGHTY-SIX CASES OF ERYTHEMA NODOSUM IN CHILDREN. J. STRZELBICKI, Pediatria Polska **8**:125 (March) 1928.

The cause of erythema nodosum has been still unsettled since Uffelmann's statement fifty years ago that it has a close relation to tuberculosis. Some authorities still adhere to his statement, and others contradict it. Strzelbicki believes that much more research will be required in order to determine the cause of the aforementioned condition. In his series of cases he found that it is most frequent at the beginning of summer and winter, and that the greatest number of the cases were found in children between 3 and 10 years of age. The lesions predominated in the following sites: forearms, buttock, face, ears, etc. The spleen was enlarged in 25 per cent of the cases. Drugs have no influence on the disease. The course of the disease is from two to five weeks. The prognosis should be guarded.

KRUPINSKI, Chicago.

Surgery and Orthopedics

THE RELATIONSHIP OF ORTHOPAEDICS TO THE PRACTICE OF PEDIATRICS. CHARLES OGILVY, New York State J. Med. **28**:2017 (Oct. 15) 1928.

The writer strongly condemns "sneakers" and soft soled gymnasium shoes. Such shoes should have a firm base. When a child begins to walk, square toed, solid soled shoes should be ordered, particular attention being given to securing shoes long enough for the feet. Flexible-shanked shoes for weak feet are wrong. A brief description is given of the treatment for foot strain, knockknees, bow-legs and postural deformities.

AIKMAN, Rochester, N. Y.

1. EMPYEMA OF MAXILLARY ANTRUM. 2. LARGE HAIRY MOLE OF FACE. TO ILLUSTRATE A NEW METHOD IN THE AFTER-TREATMENT OF SKIN GRAFTS IN CHILDREN. AVID LEVI, Proc. Roy. Soc. Med. **22**:147 (Dec.) 1928.

1. The first case was reported in an infant, aged 18 days.

2. The report of the second case is accompanied by pictures showing the patient before and after operation. The mole was excised, and a Thiersch graft was applied in the ordinary way. After the graft was in position, the whole area was sprayed with paraffin dressing and left for ten days. When the paraffin dressing was removed, the graft was found to have taken well.

WILLIAMSON, New Orleans.

CONSERVATIVE TREATMENT OF POSTPNEUMONIC EMPYEMA. JAN PAROULEK and BLAHOSLAV KADLEC, Časp. lék. česk. **65**:814 (May) 1926.

The authors discuss the efficacy of the various methods of treating empyema and the relatively poor results, especially in the chronic cases. Ethyl hydrocuprein hydrochloride inhibits pneumococcus growth in 1:800,000 and kills the organism in 1:400,000 dilutions. Ethyl hydrocuprein is more toxic than quinine, is a greater cardiac depressor, lowers the blood pressure in intravenous injection, and in large doses may produce defects in vision. Gralka reports cure in six of seven cases in children; with pleural lavage with from 0.5 to 5 per cent ethyl hydrocuprein hydrochloride. After lavage, 25 mg. per kilogram of weight, with a maximum of 0.5 Gm., was injected into the pleural cavity. The author treated an adult with a severe toxic pneumococcic empyema with intrapleural injections of 0.2 Gm. of ethyl hydrocuprein in 100 cc. of water, with recovery. In this case intravenous injections of antipneumococcic serum and intrapleural injections of a silver methylene blue combination argochrome were apparently of no value.

STULIK, Chicago.

Miscellaneous

INFANT MORTALITY IN INDIA. RAMIDAL KAPUR, Antiseptic **26**:149 (March) 1929.

Compared with that of other countries of the world, the infant mortality in India is appalling. As many as one third of the total number of children born in one year die, and in such cities as Bombay, the infant death rate may be as high as one-half. One fifth of the infant mortality is in children under 1 year, and mostly in the first month. The author believes that besides the usual antenatal causes the purdah system, early marriages and the employment of untrained and unclean servants to care for the child are important contributory factors.

SANFORD, Chicago.

PHYSICAL MEASUREMENTS OF BOYS AND GIRLS OF NATIVE WHITE RACE STOCK IN THE UNITED STATES. S. D. COLLINS, Pub. Health Rep. **44**:1059 (May 30) 1929.

Physical measurements were made on 30,000 school children of native white parents. Besides the usual measurements, these included determination of the vital capacity. As age increases, weight and vital capacity increase more rapidly than any of the other measurements taken. For every measurement made in this study, there is a period of three or more years between 6 and 13 years of age during which the mean annual increment for girls exceeds the increment for boys of a corresponding age. Also, the mean annual increments for girls exceed those for boys at considerably earlier ages than in the case of mean measurements.

MEDICOLEGAL ASCARIDOSIS. P. DOVOLLE, Ann. de méd. lég. **8**:85, 1928.

In Hongkong, 315 ascarides (some of the smallest being omitted) were found in the stomach and bowel of the body of a native girl, aged 10 years, whose parents had buried the body secretly. Five of the worms were observed in putrid fluid about the cecum in the front of which were three perforations.

E. R. LE COUNT.

ALCOHOL AND CHILD LIFE. WEEKS, Rev. internat. de l'enf. **6**:803, 1929.

Weeks maintains that alcohol is a menace to child life in all of its important epochs, germinal, fetal and postnatal.

The experimental work of Forel, Bertholet and others is quoted to sustain the claim that alcohol like lead and syphilis, acts as a specific poison to the germ plasm. This effect is termed "blastophthoria." Stockard showed that persistent alcoholic excess, whether in the father or the mother, diminishes fecundity and increases the liability to stillbirths and to the production of weakly and defective offspring. In the fetal period, the placenta does not seem to act as a filter against alcohol; so diffusible, in fact, is this poison that the degree of concentration on both sides of the placenta is practically identical. For many years, society has been vitally concerned with the postnatal experience of the child of alcoholic parents. Not only his poor heredity but his environment, as represented in bad housing, poverty, lack of care, and insufficient food and sleep, pave the way to a damaged life and the development of criminal instincts.

AMESSE, Denver.

SATURNISM IN A FIVE YEAR OLD CHILD. B. VILA, Bol. Soc. cubana de pediat. **1**:45 (Feb.) 1929.

A boy, aged 5 years, suffered from a wrist and ankle drop, with no other symptoms. Poliomyelitis, polyneuritis and West's paralysis were considered in the diagnosis. The blood showed the characteristic stippled cells of lead poisoning.

SANFORD, Chicago.

INFANT MORTALITY IN MECKLENBURG-SCHWERIN BEFORE AND AFTER THE WAR. H. BRÜNING, Arch. f. Kinderh. **86**:1 (Dec. 28) 1928.

In a comparison between the infant mortality from 1901 to 1905 and that from 1921 to 1925, Brüning found that the infant mortality was higher in the period before the war than afterward. The mortality for the first month of life was slightly higher in the post-war period than before, namely from 5 to 4.9 per cent. The total lessening of the infant mortality in the post-war period was due to the decrease in that of the later months of the first year.

SANFORD, Chicago.

ANILINE POISONING IN A CHILD. KURT OCHSENIUS, Monatschr. f. Kinderh. **43**:54 (March) 1929.

The author reports a case of eczema in which symptoms of aniline poisoning developed one and one-half hours after the application of an ointment containing diacetyl-amino-azo-toluene (called diamoza in America — pellidal, Germany). Methemoglobin was found in the blood. The bandage was removed immediately, and the symptoms disappeared in twenty-four hours.

IDIOSYNCRASY TOWARD IRRADIATED ERGOSTEROL. KURT OCHSENIUS, Monatschr. f. Kinderh. **43**:58 (March) 1929.

The author reports the case of his own child, to whom he tried to offer irradiated ergosterol. He began giving two drops when the child was 5 months of age. The child promptly vomited. The infant is now 8 months of age and has never been able to take irradiated ergosterol without vomiting. Doses of one drop or pieces of zwieback containing 2 mg. of the drug could not be tolerated.

GERSTLEY, Chicago.

THE RELATION OF ENVIRONMENT AND SCHOOL WORK IN PUBLIC SCHOOL STUDENTS. A. BUSEMANN, Ztschr. f. Kinderforsch. **35**:1 (Jan. 30) 1929.

The author continues his study of the factors in the child's environment which tend to decrease its efficiency in school. He classified the children into three groups according to the social standing of the parents, and found that the number of children to a family which was consistent with a good scholastic record decreased with the social rank of the family. For unskilled labor the maximum was one child; for the lower middle class, two to three, and for the upper middle class, five. Large families in the groups of higher social standing revealed the same scholastic inefficiency that prevailed among the children of the proletariat. Among these, it is found that from 80 to 90 per cent of the children are forced to repeat a school term. Public schools are therefore adequately organized for families showing the foregoing maximum and not for the large families of the lower classes. The explanation of these results is not as simple as the enthusiastic friends of eugenics have suggested. Large families mean poorer opportunities for each child, more chances for cross-infections and hence more absences from school, poorer health, less personal attention from parents, and undesirable conditions in the home. The size of the family is a relative figure, and its significance can be judged only when it is considered in relation with the social rank of the family. On the other hand, large families are often the result, or rather a concomitant phenomenon, of poor intelligence on the part of the parents. Hence, environment and inheritance show in this case a tendency to covariation. Persons with good inheritance factors will develop a good environment and those with poor ones, an inadequate one. In the same way, persons of the first group will tend to choose a partner of good qualities, and vice versa. The decrease of families of the higher social rank below the optimum of three to four children not only leads to a reduction of valuable elements as seen from a eugenic standpoint, but it also hampers the proper development of the living child, since the entirely normal

development of the child is possible only in the presence of other children. The articles of Busemann on this debatable subject — which usually gives rise to more heat of passion than light of knowledge — are recommended to every person interested in genetics. He has kept to the middle path and avoided the extremes of both dogmatic schools by adhering obstinately to that which can be demonstrated.

REICHLE, Cleveland.

SIMPLE APPARATUS FOR ISOLATION OF PATIENTS. I. JUNDELL, Acta paediat. **8**:375 (Dec. 22) 1928.

Directions are given for the construction of various types of isolation cubicles, out of inexpensive materials. These are not meant to be part of the fixed architectural scheme of a hospital service, but are to be readily adaptable to the exigencies of individual clinical situations whether in hospital or home. By the use of a portable cubicle of this kind it is feasible, for example, to isolate a patient in a general ward and thus avoid the psychic disadvantage of solitary confinement in a room. The effectiveness of such cubicles has been tested both by experiments in which cultures of *B. prodigiosus* were sprayed into the surrounding air, and also by much more critical clinical experiments in the transmission of chickenpox. From the point of view of hygiene, analyses of the air within such cubicles after various periods of occupancy showed an accumulation of carbon dioxide only slightly in excess of that of the air of the ward.

MCINTOSH, Baltimore.

STATISTICS ON VACATIONS SPENT IN THE COUNTRY BY THE PUBLIC SCHOOL CHILDREN IN WARSAW. W. PIATROWSKA and W. PIATROWSKI, Opieka nod Dzieckiem **6**:95 (March and April) 1928.

Statistics show that few city children go to the country for vacation. A vacation of this sort is beneficial to the health of a child. A great movement is launched by the welfare organizations and even by the government to send more children to the country for a vacation. For children who cannot afford to have a vacation, the expenses are defrayed by taxation of all the citizens.

KRUPINSKI, Chicago.

Society Transactions

CENTRAL STATES PEDIATRIC SOCIETY

Thirteenth Annual Meeting, Oct. 26 and 27, 1928

H. T. Price, M.D., *President*

A. H. Parmalee, M.D., *Secretary*

Program for Friday Morning, Oct. 26, 1928, Western Pennsylvania Hospital

Köhler's Disease. Dr. E. W. Fiske.

Urethral Transplantation. Presentation of a Case Five Years After Operation. Dr. L. H. Landon.

Pancreatic Cysts in Children. Dr. Horace E. DeWalt.

A Case of Infantile Obesity Due to Deficiency of the Posterior Lobe of the Pituitary Gland and of the Thyroid. Dr. F. B. Utley.

Tumor of the Brain (Tuberculoma). Dr. H. C. Flood.

Hirschsprung's Disease. Dr. G. J. Feldstein.

Celiac Disease. Dr. Samuel Lebeau.

Recurrent or Chronic Bronchopneumonia. Dr. Jesse Amshel.

Teratoma of Pericardium in an Infant, Aged Four Months. Dr. J. W. McMeans.

Bronchiectasis. Dr. Howard Marcy.

Hemihypertrophy: Presentation of Case. Dr. Carl Wagener.

Allergy of Children. Dr. Leo H. Criep.

Retropharyngeal Abscess. Dr. Robert A. Knox.

Hodgkin's Disease. Dr. Andrew Walhauser.

Congenital Elephantiasis of a Hemangiomatous Nature. Dr. Alfred S. McElroy.

Squint in Infancy and Early Childhood. Dr. E. B. Heckel.

Köhler's Disease. Dr. E. W. Fiske.

The two following cases are characteristic of milder forms of isolated disease of the tarsal scaphoid and illustrate the difficulties in recognition. The onset is usually insidious, with limp, pain and swelling developing around the scaphoid and some tenderness and pain on motion. Flatfoot is commonly seen in these cases. The appearance is that of a mild or low grade infection. The condition must be differentiated from trauma and static strain, tuberculosis, syphilis, osteomyelitis and arthritis. The most reliable point in diagnosis is the roentgenogram, which shows the scaphoid to be smaller, denser, flat (like a dime), irregular and often fragmented; the internal architecture is lost (canaliculi shrunken) and the surrounding bones normal. This, with the history and laboratory tests, makes diagnosis fairly simple except in early cases when tuberculosis and low grade osteomyelitis are difficult to rule out.

The first case is that of a boy, aged 7 years, whose chief complaint was a slight limp and occasional pain in the right foot. Examination showed slight tenderness in the region of the scaphoid. The feet were strapped, and the child was later given arch pads. He did not improve, and roentgenograms were taken, which showed the right scaphoid to be thin and dense and slightly fragmented with rough borders; the left suggested the same. There was marked swelling at this time, and tenderness in the region of the scaphoid and pain were constant. A diagnosis of Köhler's disease was made. Plaster casts were applied and removed one month later, at which time the feet were found to be improved and still tender.

Two months after removal, the casts were replaced by strapping. Subsequent roentgenograms showed continued bone regeneration. The recovery was uneventful, and no further symptoms ensued.

The second patient, a girl, aged 4 years, complained of an occasional limp and soreness in the arches of the feet, more pronounced in the left. Examination revealed slight tenderness, more marked on the left. The roentgenogram showed the characteristic appearance of advanced Köhler's disease, especially in the left foot, which showed little bone tissue. The right showed a diminution in size of the scaphoid with increased density. Casts were applied, with the feet in inversion, and were worn for three months; at this time the symptoms had disappeared, and a roentgenogram showed general improvement in the bony development. Further treatment for the static deformity was continued for two months, and recovery was uneventful.

The condition in the foregoing cases resembles an osteochondritis and suggests a common origin with similar juvenile conditions such as infraction of the second metatarsal bone.

The treatment consists of protecting the damaged nucleus from strain and maintaining static relations. Recovery may be expected in from two to four months.

URETERAL TRANSPLANTATION. PRESENTATION OF A CASE FIVE YEARS AFTER OPERATION. DR. L. H. LANDON.

The pediatrician and surgeon have many common interests and problems. Probably the majority of these have to do with the various types of malformations due to defects, or the actual failure of development of various structures. Of all these congenital conditions, I think that the most harrowing and embarrassing is exstrophy of the bladder. The constant dribbling of urine, with the consequent irritation, is a source of continual suffering, while the odor and the knowledge that they are defective prevents these children from normal association with other children and, in fact, cuts them off from most of the pleasures due them, and seriously handicaps their normal physical and mental development.

Exstrophy of the bladder is much more common in males than in females, as is also, of course, the similar but minor condition, epispadias. To make matters still worse, exstrophy is frequently associated with other congenital defects such as cleft palate, spina bifida, and failure of development of the genital organs.

The girl presented was admitted to my service at the West Penn Hospital on Sept. 3, 1923, when she was 6 years of age. She presented a complete exstrophy of the bladder, separation of the symphysis, and only a suggestion of the external genitalia. There was only a small and shallow vagina ending in a culdesac with no evidence of a cervix. In other respects she was apparently normal and healthy, although she already exhibited the reticence, embarrassment and shame of her condition.

On September 13, through a laparotomy, the right ureter was transplanted into the lower sigmoid by the technic which has been so well developed by Coffey. Following this transplantation, from which she recovered without any untoward symptoms, she was permitted to go home, and reentered the hospital on November 3, when the left ureter was transplanted in a similar manner. At the time of this second operation inspection of the right ureteral transplantation was extremely gratifying, in that there was no evidence of dilatation of the ureter and the kidney was normal in size and consistency.

Two weeks following the second operation, the bladder itself was excised and an attempt made to close the defect in the abdominal wall by a position of the muscles and plication of the rectus fascia. There was a complete absence of the uterus and tubes, and the ovaries were not discovered, although they are undoubtedly present.

The subsequent course in this case has been gratifying. There has been no evidence of pyelitis. For the past two or three years, the child has been able

to retain the urine in the rectum for from four to five hours regularly, with nocturia once or twice a night. She is going to school, associating normally with other children, and is apparently leading the life of a normal child. The lack of union of the symphysis has had no apparent disabling effect. There still exists an abdominal hernia at the site of the bladder and also in the inguinal region which I failed to mention had been present since birth, but with the abdominal support which she is wearing are the source of no serious discomfort.

Coffey's later technic, developed since this operation, and by which both ureters are transplanted at one operation, is a distinct advance in the procedure and apparently obviates many of the possible complications and sequelae of the operation as performed, but not encountered in this case.

The advantages of ureteral transplantation, not only in exstrophy of the bladder, but in incurable diseases of this organ such as tuberculosis, and especially carcinoma, are, I think, not sufficiently appreciated as a humanitarian palliative procedure which will relieve these patients of most of their uncontrollable and torturing discomforts. The technic is simple, may be accomplished under spinal anesthesia, and is definitely gratifying in its results, both to the patient and to the operator.

PANCREATIC CYSTS IN CHILDREN. DR. HORACE E. DEWALT.

I wish to report two cases, both of which occurred following street injuries. The first was in a boy, aged 5 years, admitted to the hospital in October, 1927, who was injured by a telephone pole rolling on him, causing a fracture of the pelvis and right femur in the upper third with no evidence of intra-abdominal injury. The fractures were treated and the boy made an ordinary recovery, being discharged about two and one-half months after the injury, apparently in good condition. At different times while in the hospital, he complained of pain in the abdomen and vomited. Nothing abnormal was noted on physical examination.

About a month after discharge, the boy was brought back to the hospital; he was emaciated and complained of abdominal cramps and vomiting. Examination revealed a cystic mass in the epigastrium about the size of a small grapefruit, which was partly mobile. Roentgen examination confirmed this observation. The stools contained occult blood. Laparotomy was done ten days later, and a smooth, bluish, cystic, somewhat oval mass situated in the layers of the gastrocolic omentum was exposed. The surface was covered by numerous gray nodules the size of a pinhead, and 350 cc. of straw colored fluid was aspirated from the cyst and the wall opened. It was smooth and glistening, with areas of nodules of fat necrosis. The cavity was packed with washed iodoform gauze and the abdominal wall closed about it. The packing was gradually withdrawn, and the patient made an uneventful recovery. The cyst cavity closed and the wound healed completely; the boy was discharged from the hospital and has remained well.

The second case was that of a boy, aged 7 years, who was injured by an automobile and admitted to the hospital fracture service in June, 1927, with some tenderness and rigidity in the upper part of the abdomen. He had a fracture of a humerus which was reduced and progressed satisfactorily, but the general condition did not improve in the right way. He began to vomit, and had abdominal cramps which increased until nearly all food taken was regurgitated. At this time the following conditions were found, which did not exist previously: The temperature, pulse and respiratory rates were normal; there was a tumor mass of good size in the epigastrium. Roentgen examination confirmed the foregoing statement; an exploratory laparotomy was advised, which revealed a grayish, cystic mass bulging forward under the edge of the liver and above the stomach. This mass was aspirated, and 500 cc. of straw colored fluid was removed. The collapsed cyst mass was then opened. There was a band of tissue bridging the cavity which was removed, and the wall was covered with areas of fat necrosis. A rubber drainage tube was placed in the cyst cavity, and the abdominal wall closed about it. Drainage diminished in amount; the tube was removed, and the incision healed completely and left the boy in his former state of health.

A Case of Infantile Obesity Due to Deficiency of the Posterior Lobe of the Pituitary Gland and of the Thyroid. Dr. F. B. Utley.

A boy, aged 13 years, was first seen three and one-half years before presentation. At that time he complained of overweight, easy fatigability and lack of interest in play.

The child was delivered by instruments without injury and was breast fed up to the age of 6 months, when partial artificial feeding was instituted. During his early childhood, he had attacks of measles, chickenpox and frequent attacks of sore throat. At the age of 5¼ years the tonsils and adenoids were removed, and a few months later a mastoidectomy was performed. At 6 years of age, he had an unusually severe attack of pertussis. He was thin up to the age of 7½ years, when he began to gain weight rapidly.

When first seen, the boy was oversize and overweight for his age, 9½ years, the height being 4 feet 7¼ inches (140 cm.) and the weight 107¼ pounds (48.6 Kg.). His fingers and thumbs were broad and spadelike. The outer angles of the eyes were somewhat elevated. The abdomen was unusually prominent. The genitalia were small. There was an unusual amount of suprapubic fat. The skin was of fine texture. The breasts and nipples were prominent, of the female type. A roentgenogram showed the sella turcica to be the size of that of a normal adult. The basal metabolism readings were —15 and —16 per cent. Vision, form and color fields were normal, and there was an enlargement of the blind spot.

The patient was placed on a diet with an increased amount of vegetables and fruits and restriction of carbohydrates and fats and was given a thyroid substance, whole gland, ¼ grain (16 mg.), and pituitary substance, whole gland 2 grains (0.13 Gm.), one hour before meals.

At the end of one month, the weight had dropped to 98 pounds (44.5 Kg.) and the pulse rate to 90. His mother stated that he was more active and more interested in his studies. This medication was continued for the next three months, when there was a gain in weight to 104 pounds (47.2 Kg.). The pulse rate had dropped to 76, and the patient was again somewhat more sluggish. The amount of thyroid substance was increased to ½ grain (0.03 Gm.) three times a day and the diet restricted as it had been previously; this was followed by a reduction in weight and a slight increase of the pulse rate.

From February, 1928, to June, 1928, there was an increase in weight of from 112 to 123 pounds (50.8 to 55.8 Kg.). He was then placed on thyroid substance, 1 grain (0.06 Gm.), and posterior pituitary lobe, 2 grains (0.13 Gm.). His weight dropped 10 pounds (4.5 Kg.); the pulse remained normal, and he presented a much better appearance and was active physically. During the summer he won two or three medals in athletic contests; he has also progressed rapidly in his studies, is practically at the head of his class and has been elected president of his class, all of which shows a marked improvement both mentally and physically during the three years he has been under observation.

The literature shows that in from 70 to 80 per cent of juvenile obese persons, there is a deficiency of the posterior lobe of the pituitary gland. This condition most frequently follows infection during childhood and is occasionally associated with hypothyroidism in which class it is believed that this patient belongs.

Obesity rarely appears before the fourth or fifth year; in this case, it appeared during the eighth year. If it occurs at birth, it is usually due to hypothyroidism. If it is due to hypogonadism, it usually appears after puberty. To be prevented from becoming permanent, the condition must be suspected and treated before the appearance of adolescence. In this respect, the subject assumes diagnostic importance.

Tumor of the Brain (Tuberculoma). Dr. H. C. Flood.

The first case for presentation is that of a white American girl, aged 5 years, admitted to the Western Pennsylvania Hospital, because of severe pain in both legs, loss of motion in the right leg and slowly progressing blindness.

Her father believed that her present trouble began about three years before admission, when she complained at times of severe pain in the abdomen and legs and in the muscles of the neck. These attacks came on suddenly and if they occurred at night, usually roused her from her sleep. Two years before admission, she was confined to bed for a month with severe pain in the abdomen, legs and neck; at times, during the attacks, her head was drawn to one side. She had had whooping cough, measles, chickenpox and scarlet fever within the past four years. She was born prematurely, and during the first year presented a difficult feeding problem.

Her mother, one uncle and an aunt on the maternal side died of pulmonary tuberculosis. One month before the birth of this child, the mother suffered an attack of lobar pneumonia. One week following the death of the mother, the child began to complain of severe pain in the right leg and in the muscles of the neck. Two months later weakness developed in the right leg, making it hard for her to walk and confining her to bed. Two weeks after this, her sight began to fail. She was never drowsy and never complained of headache. She remained mentally clear.

On examination she was well developed, well nourished, bright and alert. The pupils were widely dilated and did not react to any stimuli. No facial palsy was present. Rigidity of the neck was marked. Both knee reflexes were increased. A bilateral Kernig sign was present. There was a positive Babinski sign on the right. One week later nystagmus when she looked to the right and slight facial weakness developed on the left side. Weakness in the left arm was noted. Marked tenderness in both legs remained a constant symptom. The temperature fluctuated from 99 to 101; the pulse was full and slow. There was consolidation of the right lower lung field, which was later confirmed by the x-ray. A roentgenogram of the skull showed a widespread suture suggesting intracranial pressure. The urine was normal. The Wassermann reaction of the blood was negative. The blood counts were within normal limits. The spinal fluid showed seven cells and a slight increase in globulin. Several taps gave the same picture. No pyogenic organisms could be demonstrated. Inoculation of the fluid into guinea-pigs revealed tuberculosis.

There has been some improvement in this child since admission, and she has been permitted to be out of bed for a short time each day. She has a rather tremulous gait and has the characteristic facies of the blind. The intelligence is above normal.

The second case was that of a well developed, well nourished negro girl, aged 4 years, who was admitted to the hospital because of severe frontal headache, partial paralysis of the legs and progressive blindness.

On physical examination, the child was intelligent and alert; the pupils were widely dilated and did not react to light or in accommodation. The right disk was choked and the left disk margin blurred. No facial palsy was present. Rigidity of the neck was marked. The reflexes of the right arm were normal. The biceps reflex was present in the left arm.

One week later, she developed an external strabismus of the left eye, and the paralysis of the left arm became more marked. The legs were held in extreme flexion, and child cried bitterly because of severe pains. Marked athetoid movements of the face and hands developed, and incontinence of the urine and feces appeared two weeks later. Her condition became worse, so that operation was performed. Incision through a tense and distended dura allowed a herniation of the brain which was quite marked. Exploration failed to reveal fluid from the lateral ventricle. Examinations of the spinal fluid showed an increase in pressure, and a slight increase in globulin; the Wassermann reaction and the colloidal gold test were negative; no pyogenic organisms were present. The highest cell count was seven, and the lowest, three. Culture and inoculation into guinea-pigs revealed an acid-fast bacillus. During the acute stage of the illness, the temperature ranged from 99 to 101 F.; the pulse rate ranged from 72 to 120 and was markedly irregular.

Progress has been slow, and was interrupted by an attack of scarlet fever. She has a slight paresis of the lower half of the face. The lower extremities are in a cast, and she is blind.

HIRSCHSPRUNG'S DISEASE. DR. G. J. FELDSTEIN.

A case of Hirschsprung's disease is presented, the history of which would tend to confirm the theory of causation most favored recently, that in most cases of congenital or idiopathic megacolon, there is, or has been, an obstruction in the large intestines. Many would reserve the term Hirschsprung's disease for those cases developing as a result of congenital defect of the colon or an anomalous nerve

Fig. 1.—One hundred and ninety-two hour residue, showing marked delay and enormous dilatation of the colon in a patient with Hirschsprung's disease.

supply. In some cases, the obstruction is a result of the kinking of an abnormally long sigmoid and mesosigmoid. In other cases, the obstruction is produced by the pressure of one coil of sigmoid on the other. Males are most commonly affected. There may be effects from the pressure on the thoracic or abdominal contents. The principal symptoms are the distended abdomen, obstipation, marked peristaltic waves, attacks of vomiting and occasionally ileus.

The case presented is that of a boy, aged 8 years, who at the age of 2 weeks developed an attack of acute intestinal obstruction. During rectal examination, a mass was felt, but when it was pushed up it disappeared with relief of all the symptoms and the passage of fecal matter. At the time of presentation, the boy was undernourished and undersize and showed a markedly distended abdomen with

marked visible peristalsis, especially in the descending colon. There was a left inguinal hernia. Laboratory tests showed a trace of albumin in the urine; hemoglobin, 70 per cent. The Pirquet test was negative. The Wassermann and Kahn tests were negative; the blood chemistry was normal. Examination of the stool showed large amounts of mucus.

On roentgen examination, the left side of the diaphragm was pushed upward, and the heart was somewhat elevated. The barium meal showed enormous dilatation of the descending colon and the sigmoid, with some dilatation of the rest of the colon. There was great difficulty in getting rid of the barium meal, part of the barium remaining as long as 288 hours.

The diagnosis was made by the history of the development of the condition practically from birth, the roentgen examination and the absence of signs of tuberculous infection.

Operation was not considered on account of the good general condition of the patient, the mild symptoms and the lack of evidence of increasing obstruction. A diet was given that eliminated any coarse residue. An abdominal binder and abdominal massage were prescribed. Oil enemas at night and enemas of physiologic solution of sodium chloride in the morning, with the patient in the knee-chest position, were given. The rectal tube was allowed to remain in for long periods. Tincture of belladonna was given in increasing doses until a physiologic effect was obtained.

Celiac Disease. Dr. Samuel Lebeau.

The case presented here is that of a girl, aged 11, one of twelve children of Italian parentage. The father is 45 years old and the mother, 38; both are in good health, and there are five brothers and six sisters, all living and well.

The patient had no chief complaint and came to the dispensary at the Montefiore Hospital on the advice of the school physician. Her past medical history showed none of the usual diseases of childhood. She was normal at birth, was bottle fed and vomited considerably during early life. Her nutrition was always poor, and she was slow in walking and talking. Since she was one of twelve children and the family was in poor circumstances, much attention was not given her; as a result, her history lacks much in detail from her infancy to the time of presentation.

The child was markedly underdeveloped, badly nourished and anemic in appearance; the eyes were sunken and had dark circles around them. The pupils reacted normally. The tongue was coated; the teeth were irregular and showed bad dental hygiene. The tonsils and adenoids were hypertrophied and infected. The cervical glands were not enlarged. The chest showed a rachitic rosary with Harrison's groove. The borders of the heart were within normal limits. No murmurs were present. There was slight dulness at the hilum of the right lung; otherwise, the examination gave negative results. The abdomen was enlarged; there was no visible peristalsis. The liver and spleen were not palpable; there was no dulness in the flanks, and no fluid wave could be elicited. No masses, no thickening of the bowel nor enlarged glands were felt. There was no vaginal discharge. The extremities were markedly underdeveloped. The urine was normal.

Roentgen examination of the gastro-intestinal tract showed that the stomach was of normal size and shape. Peristalsis was fairly active. The pylorus was normal, and the duodenal cap appeared well filled, with clearcut and regular margins.

The stools were bulky, grayish, greasy and offensive, with the presence of many fatty acid neutral fats and soap.

From the clinical examination, the roentgen evidence, the character of the stools, and the general behavior of the child, a diagnosis of celiac disease was made. She was kept on the following diet during the greater part of her stay in the hospital:

Breakfast at 8 a. m.: Protein milk or skimmed lactic acid milk, 8 ounces (236 cc.); one very ripe mashed banana, one coddled egg and one slice of graham or bran bread.

Lunch at 11:30 a. m.: Skimmed lactic acid milk or protein milk, 8 ounces, ½ pound (226.8 Gm.) of lean chicken, beef steak or lamb, one slice of graham or bran bread and jello.

5 p. m.: Skimmed lactic acid milk or protein milk, 8 ounces.

Dinner at 6 p. m.: Skimmed lactic acid milk or protein milk, 8 ounces, one piece of graham or bran bread, 1 coddled egg or ¼ pound (113.4 Gm.) of lean fish or meat. The dessert was cottage cheese or a ripe banana.

Later on, she was allowed 1 ounce (30 cc.) of orange juice, and it was also ventured to add 1 drachm (3.75 cc.) of cod liver oil each morning.

A retention enema of liquid petrolatum, 1 ounce (30 cc.), was given daily, at bedtime. On January 13, two weeks after admission to the hospital, she was give 140 cc. of blood, intravenously.

Improvement could be noted in the child from day to day. The face and limbs began to fill out; the dark circles disappeared from the eyes, and the color became better; the abdomen showed much less distention, and the stools became less frequent and lost their gray color.

On February 10, an abdominal binder was secured for her; she was discharged under the supervision of the Social Service, which placed her in a convalescent home where her diet was supervised. Improvement continued, but when she was sent home and was associated again with the eleven other children and given Italian food, she lost ground.

On Oct. 16, 1928, examination showed that she weighed 50 pounds (22.7 Kg.) and was 45½ inches (115.5 cm.) high. This showed a gain of 10 pounds (4.5 Kg.) in weight and of 3½ inches (8.8 cm.) in height since January, 1928. If her diet could be properly supervised continuously, she would probably now be in much better condition.

RECURRENT OR CHRONIC BRONCHOPNEUMONIA. DR. JESSE C. AMSHEL.

One of the rare terminations of acute bronchopneumonia occurring, as a rule, in badly nourished infants is recurrent or chronic bronchopneumonia. According to Abt, this occurs in 1.5 per cent of all cases. The most important thing is to distinguish between simple and tuberculous cases, and by means of symptoms and physical signs, this is impossible in the majority of cases.

It is hard to say why in one case complete resolution takes place in a diseased lung and in another, a chronic progressive lesion. It depends on a balance between the individual resistance and the severity of the infecting organism.

Six weeks before admission to the Montefiore Hospital, L. S., a girl, aged 7 months, was ill and a diagnosis of acute bronchopneumonia was made. She was sick for twelve days and apparently recovered. She was admitted to the hospital on Dec. 16, 1925, as a "feeding" case; she was kept in the hospital for three weeks and discharged as improved. She was readmitted to the Montefiore Hospital on Jan. 21, 1926, because she seemed irritable, did not gain in weight and had paroxysms of coughing.

The infant was poorly developed and rachitic. The respirations were embarrassed and abdominal in type. There was a lagging of the right side of the chest and dulness over the whole of the right side of the chest. The breath sounds were feeble but bronchial in quality.

Repeated examinations of the urine gave negative results. Repeated examinations of the sputum did not reveal the tubercle bacillus. The Wassermann and Kahn tests were negative. The Pirquet and Mantoux tests were negative. At the last examination, the sputum was loaded with pneumococci but no tubercle bacilli.

The infant had double otitis media; paracentesis was performed. Both drums were incised, and the pus showed a culture of *Staphylococcus aureus*. At times, cyanosis and puffiness of the face were present. There was a furunculosis of the back and thighs, which cleared up with the use of vaccines. The abscess over the right trochanter was incised and drained; there was no pathologic change in the bone. The temperature was markedly intermittent with periods of remis-

sion. During the acute exacerbations, the temperature assumed the type of that of acute bronchopneumonia.

In the differential diagnosis, empyema was ruled out by two attempts at paracentesis. There was no roentgenographic evidence of fluid, and the physical manifestations were at no time diagnostic. The presence of tuberculosis was ruled out by negative sputum and negative cutaneous tests. More diffuse involvement of both lungs rather than of one would be expected. The possibility of the presence of syphilis was an important point to be considered. Serologic tests were negative.

Sulpharsphenamine and iodides were given as a therapeutic test. The presence of a foreign body was ruled out by roentgen examination. The presence of a neoplasm was ruled out by the course of the disease, and by subsequent improvements shown roentgenographically.

Treatment consisted of: 1. The usual routine therapy for febrile disease including proper diet and symptomatic treatment. The formula was: cod liver oil, orange juice, also cereals, vegetable broth, malt soup, etc.

2. Vaccine treatment with improvement of the furunculosis. This had no influence on the condition of the lungs.

3. The roentgen rays, recommended by many authors in delayed resolution. This produced no marked improvement.

4. Five injections of sulpharsphenamine since cases of delayed resolution often have an underlying syphilitic basis. Progress was slow.

5. Artificial pneumothorax, which was attempted but was not successful on account of the presence of adhesions.

6. Blood transfusion with the hope of increasing resistance.

This condition, the total duration of which was five months, must be considered chronic bronchopneumonia in an infant who had a poor start in life and lack of resistance to a tenacious infection which was neither tuberculous nor syphilitic.

TERATOMA OF PERICARDIUM IN AN INFANT, AGED FOUR MONTHS. DR. J. W. MCMEANS.

Neoplasms of the mediastinum in infancy and childhood are rather common. In 1923, Rosenson (*Am. J. Dis. Child.* **26**:411 [Nov.] 1923) reported thirty-eight cases of mediastinal new-growth, among which were six termed dermoid cysts. Morris (*Med. News,* Sept. 16, 1905), Christian (*J. M. Research,* 1902, vol. 7) and a number of foreign authors have reported on dermoid cysts and tumors of the mediastinum in children. Thus the finding of such a tumor, although a matter of interest, does not attract undue attention. However, those within the pericardium or attached to the great vessels are exceedingly rare (Schultz, in Abt: Pediatrics, Philadelphia, W. B. Saunders Co., 1926). A survey of the literature has accounted for two intrapericardial tumors — one reported by Joel (*Virchows Arch. f. path. Anat.* **122**:381, 1890) and the other by Bacigalupo (*J. A. M. A.* **71**:961 [Sept. 21] 1918). According to my knowledge, the specimen under discussion constitutes a third intrapericardial tumor, and it is for this reason that it is deemed worthy of presentation.

L. W., a girl, aged 3 months, was admitted to the St. Margaret's Memorial Hospital on Nov. 14, 1925, with the chief complaint of aphonia. She was the third child of healthy parents. The family history was negative for tuberculosis and syphilis. She was born at full term. The delivery apparently had been normal. Her weight at birth was 6 pounds (2,727.5 Gm.). There was no history of cyanosis, convulsions or hemorrhages. She was breast fed and had thrived so well that two weeks before admission she weighed 10 pounds (4,535.9 Gm.), 4 pounds (1,814.3 Gm.) more than at birth. The only abnormality that the mother noticed was that occasionally the infant did not breathe normally, i.e., there would be a momentary grasp for breath. In short, until this patient was 2 months old, the history did not differ essentially from that of the average normal breast-fed child.

The onset of the illness was insidious. About six weeks before admission, the mother noted that it seemed to hurt the child when she was picked up. It

became evident that the child developed attacks in which there was shortness of breath and blueness. These spells became more severe and more frequent. About four weeks before admission, the child became hoarse and lost her voice entirely. She could not cry above a whisper. She was never feverish. At no time was there evidence suggesting an acute infection. About a fortnight before admission, the weight began to drop rapidly.

On physical examination, the infant was slightly emaciated, somewhat blue, with a cyanotic tinge to the mucous membranes and was crying without voice. The eyes, ears, nose and mouth were essentially normal. The heart sounds were distant. There were no murmurs. The heart outline could not be determined. On percussion, the chest revealed a uniform dulness. There was a suppression of breath sounds. Examination of the abdomen and extremities yielded nothing abnormal.

The urine was normal. Examination of the blood revealed: hemoglobin, 70 per cent; red blood cells, 4,650,000; white blood cells, 5,600; the differential count showed: polymorphonuclears, 48; small lymphocytes, 37; large lymphocytes, 14; eosinophils, 1.

A roentgenogram of the chest showed practically the whole thoracic cavity to be radiopaque, with a complete obliteration of the lower air spaces. The costophrenic angles were clear, with no evidence of the presence of fluid or other pathologic condition. The mediastinal shadow was apparently grossly enlarged to such an extent that it filled the entire space of the chest.

Diagnosis was difficult. The absence of fever and the low white cell count seemed sufficient to rule out an infection.

Although the cyanosis and the spells of aphonia were suggestive, absence of these signs during the first two months together with no murmur argued against any of the usual forms of congenital heart disease. A malignant growth was considered but was thought unlikely as the child gained weight on a suitable formula. A malignant growth probably would have caused continued progressive emaciation. A clinical diagnosis of idiopathic hypertrophy of the heart was ventured. The roentgenologic diagnosis was enlargement of the thymus. As the former condition offered no hope of cure while the latter might respond to treatment, exposures to the roentgen rays were given. In spite of this treatment the attacks became more frequent and more severe, and during one of them on December 20, the patient died.

When the thorax was opened, a broad fluctuating tumor mass filled the entire anterior aspect of the chest. Both lungs were pushed posteriorly by this mass. The heart could not be outlined in its usual position. As the mass was viewed, it had a rather milky color through the thin membrane which formed a wall for it. There were no communications above or below with this large cystic mass, and it appeared to be confined entirely to a development within the chest. It formed a large disk-shaped structure which was the full width of the chest and measured about 15 cm. in diameter. It was fixed posteriorly. When this sac was opened, a large amount of light colored, milky fluid escaped, and the heart and a tumor mass were found within it. The sac was under marked tension and contracted when the pressure of the fluid was released.

The heart was of normal size and in good position. It measured 5 by 4 by 3.5 cm. It was situated posteriorly to a mass which was irregularly oval and measured 7 by 4.5 by 5 cm. Inspection of the great vessels showed them to be given off in their normal relationship. The aorta and the pulmonary artery were compressed by the mass which rested mainly on the trunk of the ascending aorta and the right auricle. The mass was attached over a distance of 1.5 cm. to the trunk of the ascending aorta. There was an intimate association between the adventitia of the vessel and the capsule of the mass. When the mass was partly released from its attachment to the vessel, a concave depression which corresponded to the contour of the artery was noted. The mass was not situated between the layers of the adventitia of the aorta as it was easily peeled from its position and the remains of the adventitia were found in the concave depression.

The mass itself was an irregularly lobulated small growth the size of an orange, which had a semicystic feel. The capsule varied in color from a light translucent gray to milky yellowish white. Within, there were numbers of cystic compartments the size of a pea which could be made out on close inspection of the capsule.

On section, the mass showed a multiloculated cystic structure with islets of homogeneous tissue of varying color. Most of the cysts were thin walled and smooth lined, and the majority of them contained a slimy mucous or gelatin-like material. There were cysts that contained a white semisolid material which had the appearance of parboiled tapioca. Growing within the wall of other cysts was a pale yellow homogeneous brain-like substance, or again, a dark colored tissue of the same consistency. Many of the cysts intercommunicated and the general nature was that of a polycystic adenomatous-like growth which from its gross appearance was thought to be an intrapericardial teratoma.

It should be noted that the pericardium itself, although somewhat milky in color, was smooth and glistening. Bacteriologic examination of the fluid in the cysts showed no growth.

The lungs were healthy, except for edema, passive congestion and atelectasis of the posterior parts of the lower lobes.

No masses were found in the mediastinum, and there were no enlarged glands about the hilum of the lungs.

Section of the tumor showed it to be composed of a number of tissues which included glial structure, ganglion cells, choroid plexus or ependymal structures, skin, hair follicles, sebaceous glands, sweat glands, muscle, mucous glands, cartilage-like perichondrium and connective tissue in which there were fat and vessels that contained red and white cells.

The predominating tissue resembled glial structures.

Bacigalupo stated that pericardial tumors occur rarely, having been reported twice in 5,700 necropsies since 1906. However, this author described a mucodermoid cyst of the pericardium which occurred in the region of the left auricle and noted that it was easily removed from its bed over the aorta.

There was no description of a second case.

Joel described a teratoma the size of an egg found in the pericardium of a boy, aged 14 years. On section, the tumor was found to be made up of cysts that contained slimy or gelatin-like material. He believed the tumors to have arisen from a misplaced lung anlage. The tumor was situated over the anterior wall of the left ventricle, and immediately beneath it was the left coronary artery. The surface layer of the tumor blended directly with the adventitia of the pulmonary artery and was firmly grown to it. Microscopically, the tumor was noted to be composed of fat, connective tissue, elastic tissue, small and large blood vessels, filled with red and white cells, cartilage-like perichondrium and mucous glands. The similarity of the case reported to that of Joel is quite pronounced in that the growth showed a polycystic character and contained elements derived from the three germ layers.

Summary.—The child was born with a tumor anlage. This tumor was an intrapericardial polycystic teratoma.

The mass pressed on the great vessels, and as a result there was a gradual development and accummulation of pericardial fluid. As this "bag of water" increased in size, the spells of apnea and cyanosis increased in severity. Death was due entirely to mechanical pressure.

BRONCHIECTASIS. DR. HOWARD MARCY.

I do not know of any condition that is more distressing and in which treatment is more discouraging than bronchiectasis. The condition is usually acquired but rarely congenital and is always secondary to some other infection. More of it is being seen than formerly. The areas involved may be unilateral, bilateral, localized and diffuse. One of the boys reported here presented one of the most diffuse types of bronchiectasis that I have ever seen in a young patient. Both lower lobes were involved. The bronchiectasis came on after an attack of influenza

when he was 1 year old. Following the acute illness, the condition did not clear up as it should have, and one year after, large quantities of sputum were removed. At the time of presentation, it was easily possible, by means of a drainage tube, to empty out from 500 to 1,000 cc. of material.

When the disease has developed, the symptoms are usually marked pallor, some dyspnea and a paroxysmal cough, which is usually worse in the morning.

The other boy presented a milder infection. The onset occurred in early childhood, following whooping cough. The best way to treat this condition is by drainage, and I am afraid that the most simple form of drainage, that is, postural drainage, is neglected. This boy demonstrates very markedly what can be accomplished by postural drainage. Up to two months after the onset, no attempt was made at postural drainage. The boy was toxic, underweight, pale and had an excessive cough. During the two months before presentation, postural drainage was carried out three times a day, for ten minutes, and the amount of sputum was decreased one-half during a period of eight weeks. The patient now plays and acts like a normal boy, and his color is better. A free flow of material is obtained by postural drainage three times a day, so that he lives a normal life.

The other boy has not done quite as well with the postural treatment, although with it he has shown considerable improvement and is much more comfortable than before treatment.

Drainage can be facilitated and helped by bronchoscopy, but I feel that in children it is rather unsatisfactory. These cavities must be completely drained over a long period, and it is almost impossible to perform bronchoscopy on these children at intervals as frequently as it should be done in order to keep the cavities drained out.

In another patient, a boy, aged 10 years, bronchoscopic drainage was done over a period of from two to three months at equal intervals; however, he became extremely nervous and began to loose ground more because of the fear of bronchoscopy than of anything else. Postural drainage was instituted, and he made better progress than when bronschoscopy was done. After the lung was relaxed, the amount of sputum remained materially decreased.

I wish to emphasize the fact that much more bronchiectasis is seen now than was suspected a few years ago, and that these patients who go about with a chronic cough can be materially benefited by postural drainage. I believe that if the physician insists on the parents carrying out postural drainage from two to four times a week over a period, he can do a great deal toward bettering this condition. In this way, the patients can live normal lives and can be much happier than they were with the cough and constant presence of sputum.

HEMIHYPERTROPHY. PRESENTATION OF CASE. DR. CARL WAGENER.

An infant, aged 20 months, came to the outpatient department of the Children's Hospital on Oct. 18, 1927. The mother gave the following history: When the child was between 3 and 4 months of age, she noticed that one side of his body seemed to be larger than the other. The family physician was called, but he did not pay much attention to this and assured her that the child would grow out of the condition. About one month later, the physician was again called in, and the mother again called attention to the fact that one side of the body seemed to be larger.

Examination on the first visit gave essentially negative results, with the exception of the hypertrophy. The left femur was ¼ inch (0.6 cm.) longer than the right, and the lower part of the left leg was ⅜ inch (0.9 cm.) longer than the right. There was no disease of the bone.

A diagnosis of hypertrophy was made, and the child was placed under the care of Miss Wright, physiotherapist. The mother was instructed in massage for the left arm and leg, and in exercises for the right arm and leg, the muscles of which had less tone. The mother noticed that the boy had not been using the right arm and leg as much as the left.

At the next visit, the instructions were reviewed. The tone was improved. On Nov. 1, 1927, the left arm and leg had not increased in size. The tone of the muscles of the right arm and leg had improved. On Nov. 15, 1927, the measure-

ments were the same. The tone of the muscle in the right arm and leg was improving. The left arm and leg felt more natural. The mother happened to remark that a cousin had been born with what she thought was a similar condition of one hip, which stayed unchanged. This relative is an adult now, and the condition is the same as when she was growing.

On Nov. 29, 1927, the mother noticed that on attempting to stand the child used both legs to support the weight of the body. She stated that formerly he stood on just the left leg.

On June 19, 1928, the child walked unassisted. One-half inch elevation for the right shoe was ordered to make the legs equal in length.

ALLERGY OF CHILDREN. DR. LEO H. CRIEP.

It is generally agreed that no case of allergy, whether it is eczema or hives, asthma or hay-fever, is considered thoroughly studied unless an effort is made to establish the presence of a state of specific hypersensitiveness in the patient. If this is true of adults it certainly holds good in children, because the element of chronic infection does not play such an important rôle in the latter. For establishing such a state of hypersensitiveness, one can rely on a careful history and what are known as skin sensitization tests. But there are occasions, when, due to the age or condition of the patient, such tests may not be performed. In such cases, one resorts to what is known as indirect testing, or passive transfer. The information derived is identical with that derived from direct skin testing.

In 1921, Prausnitz and Kustler demonstrated that it is possible to sensitize normal human skin to a protein by injecting the serum of a sensitive patient into the normal skin. The proof that the site of injection is thus sensitized lies in the fact that if the protein is subsequently injected in that site, a wheal with pseudopods or a positive skin reaction occurs. Kustler himself was sensitive to fish. He injected 0.1 cc. of his serum intradermally into Prausnitz. On injecting fish extract into the sensitized site, he then obtained a positive reaction. That this is a specific reaction has been proved by many workers. Thus, a positive reaction may not have been obtained if any other protein, for example, milk, has been injected. This observation was then adopted in the field of applied immunology to test a patient indirectly. The tecnic is as follows:

The serum of the patient is collected by either defibrinating or centrifugating the blood. Ordinary aseptic precautions are observed. When there is a doubt about the Wassermann reaction, the serum is rendered sterile by passing it through a Berkefeld filter. The skin of the arm of a donor or substitute is then sensitized by the intradermal injection of 0.1 cc. of the patient's serum. From six to twenty-four hours later, one injects the suspected protein into the sensitized site. If the patient is sensitive to this protein, the substitute will show a positive reaction, as evidenced by erythema and the formation of a wheal with pseudopods. But, one might ask, what if the substitute is himself sensitive to the protein? In that case, of course, a positive reaction will occur on the sensitized site, but on running a control, that is, on making an intradermal injection of the protein alone, one will also obtain a positive reaction. In that case, another substitute must be found. During the period of testing, it is well to warn the donor against eating any articles of food that are suspected as being factors in the patient's condition. Thus, if the patient is sensitive to milk and if the substitute takes milk after the patient's serum has been injected into his arm, a sufficient quantity of unaltered milk may reach the sensitized site so that it will swell in as many places as the patient's serum has been injected. I recently had occasion to study such an instance.

I was doing a passive transfer on an infant, aged 13 months, who had severe eczema and asthma. I transferred the infant's serum, in 0.1 cc. doses, to the mother's arm and instructed the mother to come in the following day for the tests. When she came in, she presented a tremendously swollen arm with a characteristic local reaction; on questioning, it developed that she had some milk and eggs for

lunch. Subsequent testing revealed the infant to be sensitive to both. A sufficient quantity of these foods was absorbed in an unaltered state from the gastro-intestinal tract to give the reaction. It is also interesting to note that because the mother noticed that the infant did not tolerate milk, she was still breast-feeding him, unmindful of the fact that enough cow's milk was reaching the infant through her own breast milk to keep up both the eczema and the asthma.

As coffee and tea seem to irritate the sites, the substitute is asked not to take either.

Passive transfer, then, is of value as a method for indirect testing when direct testing is not practical. It is frequently used also because when it gives a positive reaction, it invariably denotes clinical sensitiveness, whereas a positive skin test obtained on direct testing merely indicates skin sensitiveness. Another advantage in passive transfer lies in the fact that it never gives rise to the unwelcome constitutional reactions which one encounters occasionally in direct testing.

Summary.—Passive transfer has a definite place as a diagnostic measure in the diagnosis of allergic conditions. The technic is described. It has the advantage that it is specific and, furthermore, that it will not give to constitutional reactions.

RETROPHARYNGEAL ABSCESS. DR. ROBERT A. KNOX.

Nontuberculous retropharyngeal abscess, although not common as compared with other conditions of the pharynx, is seen not infrequently by those whose practice includes the examination of many sick children.

CASE 1.—S. V., a white infant, a boy aged 11 months, had difficulty in breathing and swallowing, which began two days before admission to the hospital. On examination, a large fluctuating mass was found on the left side of the retropharynx. An incision was made and drainage instituted. The child remained in the hospital for one day. Recovery occurred.

CASE 2.—C. H., a white infant, a boy aged 1 year, had dyspnea and difficulty in swallowing. Five days prior to admission to the hospital, the child had an infection of the upper respiratory tract. Two days before admission he had some difficulty in breathing, but digital examination of the pharynx revealed no mass. The following day, the condition remained the same. On the morning of the second day, the mother noticed that he was dyspneic on awakening. There was a considerable amount of mucus in the throat. He swallowed with difficulty.

On examination, a tense mass was found on the posterior wall of the pharynx, just below the right tonsil. An incision was made and drainage instituted. The child remained in the hospital for four days. Recovery occurred.

This is a fairly typical case.

CASE 3.—J. H., a white infant, a boy aged 3 years, presented swelling of the cervical glands and difficulty in swallowing. The condition began one week before admission to the hospital with nasopharyngitis; breathing was noisy when he was asleep. Two days before admission, a condition thought to be a low peritonsillar abscess developed on the right side. The following day, the abscess was incised and drained. The same evening, in an attempt to swallow, he seemed to choke and a paroxysm followed during which he expelled considerable pus, mucus and blood. After he was admitted to the hospital, examination of the throat revealed the presence of a right pharyngeal abscess which had ruptured spontaneously. The opening was enlarged and more pus evacuated. The following day, a profuse secondary hemorrhage occurred, which the patient did not survive.

This case suggests the possibility of two pharyngeal abscesses, one above the other, both going on to suppuration and with an interval of only a few hours between, and a secondary hemorrhage due to erosion of the wall of the blood vessels.

Case 4.—W. R., a white infant, a boy aged 14 months, began to have difficulty in breathing and swallowing two days before admission to the hospital. He had erysipelas involving the forehead about one month before admission, with an abscess of the scalp and later a collection of fluid under the periosteum over the globella. This subsided without drainage. Two weeks later, he had bilateral otitis media. The discharge gradually grew less, and the ears were dry in about one week. Five days previous to admission to the hospital, swelling on the left side of the neck at the angle of the jaw appeared. Two days later, the mother noticed that the child had some difficulty in swallowing.

On the left side of the posterior pharyngeal wall, there was a large fluctuating mass extending from the epipharynx downward to the level of the epiglottis. Incision was made and drainage instituted. The child remained in the hospital for one day. Recovery occurred.

Twelve cases were analyzed. The ages of the patients ranged from 3 months to 3 years; six were under 1 year of age and one, over 15 months. There were eight boys and four girls. In six, the abscess was on the right side and in four, on the left. In two, the location was not definitely stated.

The onset of the illness ranged from two days to three months before admission to the hospital. The illnesses included rhinitis (most common), pharyngitis, tonsillitis, cervical adenitis, otitis media and erysipelas and combinations of these.

Patients with uncomplicated cases did not remain overnight in the hospital. The average length of time in the hospital was three days.

The mortality rate for the series was 33⅓ per cent.

Hodgkin's Disease. Dr. Andrew Walhauser.

In the limited time at my disposal, it is difficult to give more than a brief description of the experimental work now being carried on in the treatment for Hodgkin's disease. I wish to emphasize the fact that the work is still incomplete and that no definite claims are made at this time. The reactions obtained in the several patients under treatment are sufficiently uniform to warrant further work along the lines about to be described.

As all physicians are undoubtedly acquainted with the nature of Hodgkin's disease, I shall not take time to discuss this part of the subject. In making the diagnosis, I have used Longcope's comprehensive histologic description, as it represents an excellent transcription of Sternberg's original. Each case has been corroborated by others, both pathologically and clinically, in order that personal error and diagnosis may be eliminated.

Hodgkin's disease is of toxic origin, in my opinion, and the lesions of the disease contain the products of the granulomatous process, including a specific toxin which is possibly the result of the infection. By removing some of the specific tissue from the patient and extracting this material in a suitable manner, it is possible to obtain the toxic substance. This is used in much the same manner as tuberculin, i. e., through the use of small, gradually increasing doses over a long period. The immunologic response is, however, not parallel with that seen in tuberculosis, as I feel that it is the stimulation of the general reticulo-endothelial system and the consequent liberation of antibodies which accomplish the result at the site of the disease process. The injections are given subcutaneously every day for two or three doses and then every other day for ten doses, the interval being increased to every three days and the injections finally being given once a week for at least six months. In addition, the patient is placed in as favorable a condition as possible by the institution of general hygienic measures. No roentgen treatment is given, nor is any other medication necessary.

It is not claimed that all patients with Hodgkin's disease can be treated by this method. In the series under observation at present, some responded much better than others. In cases showing extensive involvement of the bone, the treatment appears to be of no avail.

A description of some of the cases might be of interest. A man, aged 40, came under observation in a state of advanced cachexia, showing dyspnea, Pel-

Ebstein temperature, anemia, marked generalized lymphadenopathy and other symptoms of this state. He was confined to bed and had lost considerable weight. An extract was made for him in the manner described and was administered. Improvement began almost immediately and was sufficiently pronounced to allow him to be up and about three weeks later. The glands slowly decreased in size; the dyspnea left him, and at the end of six months' treatment he was able to return to work. He has been clinically well for nearly two years. At the beginning of the treatment, he had a large mass in the mediastinum. A roentgenogram taken six months after the beginning of the treatment showed a small fibrous mass in the mediastinum. He has gained considerable weight and looks and feels well.

A second case was somewhat different, presenting the larval type of Ziegler. In this patient, the condition had been diagnosed as Hodgkin's disease by surgeons of the United States Navy and the Veterans' Bureau. He had a large mass in the neck and axilla and showed involvement of the pectoralis major. He was cachectic and complained of nausea and vomiting. He could not eat and was slowly losing weight. Improvement in this case was not as rapid as in the first case, but was quite definite. In the second case the roentgen rays were not used, not even for making roentgenograms, in order to show that they had no connection with the clinical results. Five months after treatment was begun the patient was able to return to work, having gained considerably in weight, and having no signs of glandular involvement or cachexia. He was difficult to control and refused to come to the hospital, as he felt very well. He continued to feel so for about six months, when he suddenly suffered an acute relapse, losing 30 pounds (13.6 Kg.) in three weeks and showing widespread and marked enlargement of the lymph nodes. At this time, he was considered to be moribund. An extract was made for him and given. The response was immediate and satisfactory, the nodes disappearing and the cachexia clearing up. He gained back his original weight and is today at work at hard labor and is free from symptoms and signs of the disease.

I regret that it is impossible to give more case histories, as there are a number which might be interesting. The reaction that has been described requires an explanation. This method presents a new plan of treatment in cases of Hodgkin's disease for which certain hopes are justified.

CONGENITAL ELEPHANTIASIS OF A HEMANGIOMATOUS NATURE. DR. ALFRED S. MCELROY.

A child, aged 2 years, was brought to the Pediatric Clinic at the Allegheny General Hospital because of swelling of the right leg and thigh and of the abdomen on the right. According to the history obtained, this condition had been present since birth, though the previous medical history was unimportant, the child having never been ill otherwise. According to the history obtained, the swelling had been unilateral, had never either increased or decreased in size, and had apparently not been painful.

The physical examination gave essentially negative results, except over the left side of the abdomen, where there was an extensive distention. This swelling extended from the costal border, involved the labia majora and the thigh and extended down as far as the knee. The swelling did not transmit a fluid wave, nor did it pit on pressure; it was not tender to the touch. The skin over it was shiny and smooth. On the inner aspect of the knee was a hard nodule of the consistency of cartilage, about the size of a hickory nut. It was not tender.

Laboratory reports showed that the Wassermann reaction was negative; the red blood cell count was 4,200,000, and the white blood cell count, 17,500; hemoglobin, 85 per cent; the blood smear was negative for *Filaria* and the differential blood count, normal. Roentgen examination showed the bones of the thighs to be equal on both sides. Roentgen examination of the chest gave negative results.

Twenty-one days after admission to the hospital, an exploratory operation was performed; an oblique incision was made over the right inguinal canal, extending

well down into the labium majorum. A wedge of skin with thickened subcutaneous tissue was removed for diagnostic section. The postoperative diagnosis was: lymphatic hyperplasia of the right side of the body, extending from the costal margin to the right knee joint and limited at the midline. On section, both pieces showed a grayish color on cut surface; no definite nodules were felt.

Microscopic description showed strands of endothelium growing within some of the vessels. One area showed small spaces lined with endothelium and the spaces filled with blood. The lymphatics were dilated. There was some lymphocytic infiltration.

The clinical diagnosis was congenital elephantiasis.

SQUINT IN INFANCY AND EARLY CHILDHOOD. DR. EDWARD B. HECKEL.

I am grateful for the privilege of discussing squint in infancy and early childhood, because there are so many erroneous conceptions concerning the development of it and so many alleged causes for its existence. In considering this subject, one must have in mind the anatomic structures involved, and must remember that the movements of the eyeballs are not simple but are complex. Each eyeball is provided with four straight muscles and two oblique muscles. It must also be remembered that these muscles, all but the inferior oblique muscles, arise from the apex of the orbits, and that the apexes of the orbits are rather close together, while the eyeballs are widely separated, so that the muscles diverge from their origin to the eyeballs. In general terms, the oblique muscles may be regarded as guy-lines to prevent the eyeballs from rotating in their various movements. The eyeballs not only move upward and downward, but also outward and inward, and have the power of converging, so that both eyeballs may be fixed on the same objects, permitting the image of the object in each eye to fall on similar points of the retina, and thus result in binocular single vision.

In addition to the six muscles which move the eyeball, there are two muscles within the eyeball — the sphincter of the iris, which controls or governs the size of the pupil, and the ciliary muscle, or muscle of accommodation, which enables the eye to change its own focus. Normally, the two eyeballs move in unison in every direction. In other words, the movements are concomitant, one eye following the other. Any deviation of the position of the eyeballs in their various movements, that is, when they do not move together, or when there is no concomitant action, is designated as squint or cross-eyes. Each of these various movements is presided over by a special nucleus within the brain, so that there is a nucleus or little brain which presides over the function of convergence, that is, bringing the visual axes together so as to focus on the same point. There is also a nucleus which presides over the function of accommodation. As objects are brought closer to the eyes, it is necessary for the eyes to converge and also to accommodate. These two functions and the two nuclei of accommodation and convergence are so closely associated that there is no accommodation without convergence, and no convergence without accommodation. Overstimulation of accommodation frequently results in overstimulation of convergence, or a squint. This focusing of the two eyes on the same point is frequently spoken of as the power of fixation and is innate, as it is found in earliest infancy, and may be regarded during this time of life as a purely simple reflex action, as it is in evidence only momentarily, when the attention of the infant is directed or attracted by a bright object or a bright light. Real fixation, and the so-called fusion center, is not fully developed until the child reaches the age of from 1 to 2, or even 3 years of age.

Squint in infancy and early childhood may be divided into two classes — paralytic and dynamic. The diagnosis is quite simple — in the paralytic squint, the squinting eye fails to move in the direction of the paralyzed muscle. In a dynamic squint, while there is convergence of the visual axes, with one eye turned in, yet the eyeballs move together in all directions. This form of squint is called a concomitant convergent squint. This again may be divided into an accommodative squint and a permanent squint — in either case, one eye only

and at all times is used as the fixing eye. One may also speak of an alternating squint, in which one eye fixes at times, and at times, the other eye fixes, or there may be a periodic squint, in which either eye may be the squinting eye, and at times they are quite paralleled and no squint is manifested. This classification is essential in considering a prognosis. The prognosis is always good in an alternating squint and in a purely accommodative squint; it is very good in a periodic squint and is always good when there is no so-called amblyopia.

In taking the history of these cases, it is found that parents assign many causes for the development of this condition, such as the result of scarlet fever, measles, fright, etc., all of which are the result of a "post hoc ergo propter hoc" reasoning, that is, they reason that the condition happened after some other condition, which, of course, is false logic. As a matter of fact, the "stage," as it were, for the development of the squint is a congenital developmental condition and is already set when the child is born. While I have stated that fixation is innate and exists in earliest infancy, but as a purely reflex condition, real fixation or fusion of the two images does not take place until the child is perhaps 6 months, or 1 or 2 years of age, or perhaps even a little older, so that many of these cases do not develop until the child is from 6 months to 2 years of age. The congenital developmental defect, which gives rise to this convergent concomitant squint, may be a simple hyperopia, with either eye entirely normal in every other respect, or it may be that one eye has an "amblyopia," which literally means weak sight. This term is really an apology for what is not known, as the most careful and painstaking ophthalmosocopic examination of the so-called amblyopic eye fails to show any deviation of the fundus from the normal; yet it is only reasonable to assume that there must be a congenital developmental defect in the finer retinal structures, which has permanently reduced the visual acuity of the eye. Some of these eyes, which, of course, are always the squinting eyes, are sometimes said to have an "amblyopia exanopesia" or weak sight from nonuse. My experience proves this to be a misnomer; in other words, I do not believe that there is such a thing as amblyopia exanopesia. The part which the retina plays in the visual act is a purely chemical one, in which the light energy, which falls on the retina, is changed by chemical action into another form of energy, capable of being transferred along the optic nerve to the visual center of the brain, there to be translated into vision, so that nonuse of this function does not exist, as light always enters the amblyoptic eye, just the same as it enters the other good eye.

The practical side of this question, of course, rests in the early recognition of these cases and the proper treatment. A child who shows any evidence of squint is never too young to have the eyes looked after, in order to establish a correct diagnosis. Many of these cases show a simple hyperopia, with an overaccommodative impulse, resulting in a concomitant convergent squint, so that as the child overaccommodates, it also overconverges; this is then recognized as a squint. All of these eyes should be placed and studied under the influence of atropine, in order to relax completely the muscle of accommodation and thus relieve and relax the convergence impulse. It is remarkable to see how many of these patients under the influence of atropine have perfectly parallel eyes, which remain so by the use of proper correcting lenses, which in time relieves the accommodation strain. In all children with squint, the eyes should be thoroughly studied under the influence of atropine, and proper correcting lenses adjusted when the child reaches a proper age, 2 or 3 years, or sometimes earlier. In many of these cases, the persistent use of correcting lenses over a period of years will not only remove the squint while the patient is using the lenses, but will often result in a permanent cure without glasses. On the other hand, many of these patients go on indefinitely with parallel eyes under proper lenses, and without them, the squint immediately reappears.

The thing that I want to emphasize most fully, however, in the handling of these cases is that no child is too young to have the eyes examined and no operative procedure should be permitted during early life; in fact, my experience, extending over a number of years, has taught me never to operate on a person with a convergent concomitant squint until the patient is fully developed; I mean

that it is safest, as a general rule, not to think of any operative procedure until the patient has reached full maturity, about 20 or 25 years of age. Early operations often result in later years in a divergent squint, which is decidedly more disfiguring than a convergent squint.

I shall limit my report of cases to a few typical ones:

CASE 1.—The parents of A. K., aged 4 years, stated that the cross was first noticed when the child was about 2½ years of age, and that sometimes, even at the present, the eyes were straight; this would make the case one of a periodic concomitant convergent squint. Ophthalmoscopic examination revealed a hyperopia of about 4 diopters in each eye; otherwise, it gave negative results. Under the influence of atropine for several days, the eyes became entirely straight, at which time the shadow test showed a hyperopia of 5 diopters in either eye. Correcting lenses of plus 3.50 diopters sperical lens were ordered, and with the use of these glasses, the eyes remained straight.

CASE 2.—The left eye of W. G., aged 8 years, had turned in since the child was 3 years of age. The child had worn glasses of a very weak plus sphere with a very weak plus cylinder, prescribed by an optician. Examination showed a concomitant convergent squint, with the left eye definitely the squinting eye. Ophthalmoscopic examination showed a hyperopia of about 4 diopters, with normal fundi. The visual test revealed: vision in the right eye, 20/50; in the left eye, 20/200. The shadow test showed a hyperopia of 4 diopters. A pair of lenses of plus 3.00 diopters spherical lens was ordered. With the use of these lenses, the eyes remained parallel. This is a typical case of concomitant convergent squint, with a so-called amblyopic eye.

CASE 3.—The parents of B. H., aged 2 years, stated that the eyes at times were crossed and at times were straight. Examination showed a periodic concomitant convergent squint. Under the influence of atropine, the eyes remained parallel. The shadow test showed a hyperopia of nearly 5 diopters. Correcting lenses of plus 3.50 diopters spherical lens were ordered, the use of which kept the eyes parallel.

CASE 4.—The parents of T. H., aged 2½ years, stated that the left eye always turned in. Under the influence of atropine, the eyes were parallel. Ophthalmoscopic examination revealed normal fundi, and the shadow test showed a hyperopia of 1½ diopters. No glasses were ordered in this case.

CASE 5.—S. M. was first seen in 1893, at that time being 16 years of age. The eyes had crossed more or less since early childhood. She had been wearing glasses for several years. Examination showed a concomitant convergent squint of the purely accommodative type. At that time, the shadow test revealed a hyperopia of 4 diopters in each eye. The use of the glasses produced parallel eyes and a disappearance of the squint. It has been my privilege to have seen this patient off and on during the last thirty-five years. With the glasses, the eyes are parallel, but even now, the moment the glasses are removed, the squint becomes manifest.

It is quite essential that these patients should be seen at intervals of from six to twelve months, and the eyes fully and carefully refracted; even in those cases in which there is a decided amblyopia of one eye and in which the squint may even persist, after careful refracting, the patients should be kept under observation for a number of years, before any operative intervention is thought of, as previously stated.

Program for Friday Afternoon, Oct. 26, 1928

SYMPOSIUM ON ORTHOPEDIC TREATMENT FROM THE STANDPOINT OF THE PEDIATRICIAN

Infantile Paralysis. Dr. C. C. Yount.
Cerebral Paralysis. Dr. W. O. Markell.
Obstetric Paralysis. Dr. Voigt Mooney.
Congenital Dislocation of the Hip. Dr. J. A. Heberling.

Postural Defects. Miss Jessie Wright.

Osteogenesis Imperfecta. Dr. J. M. King.

Lung Suppuration. Dr. Ellen J. Patterson.

An Unusual Case of Intussusception. Dr. Carl Ruder.

Hydrocephalus. Dr. Ralph Robinson.

(A) Splenectomy Followed by Compensatory Regeneration of Mesenteric Lymph Glands. (B) Peculiar Infection of Face and Neck with Atresia of Mouth and Esophagus. Dr. E. W. Meredith.

Papillomas of Mouth in Infancy. Dr. E. W. Stevenson.

Empyema in Infancy. Dr. Robert Entwisle.

Empyema Rupturing into Bronchus. Dr. J. A. Rodgers.

Electrocardiograms in Persons with Congenital Heart Disease. Dr. J. M. Lichty.

Transposition of Organs. Dr. H. T. Price.

Aneurysm of Right Internal Jugular Vein. Dr. J. L. Foster.

Congenital Defects of the Ears, with Roentgenograms. Dr. John R. Simpson.

Infections of the Ear in Infants. Dr. K. M. Day.

SYMPOSIUM ON ORTHOPEDIC TREATMENT FROM THE STANDPOINT OF THE PEDIATRICIAN

Infantile Paralysis. Dr. C. C. Yount.

The treatment that I thought would be the most important to the pediatrician is the stage of prevention. About 60 per cent of all the operative work done in orthopedics is correction of deformities resulting from infantile paralysis. I feel that a fair percentage of these deformities should never develop and that if a systematic regimen was carried out during the stage of tenderness, many of these deformities would not occur.

The case presented here is that of a child from the country who has never received any special treatment. The child cannot walk, nor has she tried to walk since the onset of the disease. On analyzing the muscle power in this child, I know that she has sufficient power to walk without braces. Her hip flexion is fair. Quadriceps power is present. Foot power is adequate for good walking. The deformity is a typical one which developed from lack of splinting during the stage of tenderness. The hamstrings are tight. There is no special deformity of the foot. The same kind of a deformity prevails on the left as on the right.

If the limbs had been properly splinted in the beginning in this case, the child would be walking without braces.

Cerebral Paralysis. Dr. W. O. Markell.

The cerebral palsies of childhood constitute a most unsatisfactory group from all standpoints. Yet even while this must be fully admitted, orthopedic surgery still can do a great deal to improve the condition of the unfortunates.

In cerebral paralysis disability is the result of spasticity, deformity, loss of balance and mental deficiency, factors which are present in the individual case in varying degrees. Deformity is a more disturbing element in this than in most other conditions, for it not only adds its own percentage of disability but also still further decreases the defective control through its reflex irritation of the nervous system. The relief of this reflex central irritation seems to explain the marked improvement in the mental condition which is frequently seen after the correction of severe deformities.

Deformity is the direct result of spasticity, the parts being drawn in the direction of the pull of the stronger muscle groups. Since it is known from the outset, therefore, just what type of deformity each part will develop, the indications for preventive treatment are unusually clear and this should be begun as the paralysis is recognized, that is, as soon after birth as possible. At this time the required measures are really exercise twice a day and fixation, which during infancy

is maintained practically for the entire twenty-four hours but after walking is begun during the recumbent periods only. Muscle training, usually in the form of games, is begun as soon as the patient's mental condition permits. No other measures than these are indicated until the period of natural repair of the cerebral lesion has passed. When properly carried out, this simple regimen will prevent the development of disabling deformity, at least in the less severe cases, and in a fair percentage is sufficient, when combined with the natural repair, to give a satisfactory functional result.

When natural repair has ceased, persistent deformity may be corrected and the strength of the opposing muscle groups more nearly balanced by tenotomies and myotomies. A third measure is also available, neurectomy, which aims to restore the balance between the opposing muscle groups by producing a secondary degeneration of a portion of the stronger group.

In our clinic, it is felt that ordinarily this procedure should not be used until all the improvement possible by the other methods has been secured.

OBSTETRIC PARALYSIS. DR. VOIGT MOONEY.

Paralysis of the arm occurring during delivery is now generally admitted to be due usually to stretching, or rarely, to actual rupture (tearing), of the cords which form the brachial plexus. According to the cords that are injured, the upper arm, the lower arm or the entire arm is affected. Clinical observation has shown that in the great majority of the cases the injury is repaired, either completely or to a large degree, and that the great part of the residual disability seen in neglected cases is the result of the contractures which have been allowed to develop while the paralysis existed. Since the upper arm type of paralysis is by far the most common and since its treatment illustrates satisfactorily the principles involved in all types, it alone will be considered.

In the neglected case of this upper arm type of paralysis in which the patient is seen several years after the nerve lesion has been repaired, the evident disability is that caused by the limitation of abduction and of outward rotation of the arm; this is shown noticeably when the child tries to bring the hand to the mouth, the elbow moving markedly outward and forward. This limitation of motion is due chiefly to the contracture of the pectorales, the subscapularis and the anterior and inferior portions of the capsule.

Obviously, therefore, early treatment should be directed particularly toward the prevention of these contractures. This is accomplished by (1) daily manipulation, (2) fixation in abduction and outward rotation, and (3) muscle reeducation as soon as sufficient power has returned. In carrying out these measures, it is important to remember that the range of motion of the shoulder is considerably greater during infancy. Fortunately, the injury is usually unilateral, and hence the individual range can be readily determined by examination of the unaffected side.

CONGENITAL DISLOCATION OF THE HIP. DR. J. A. HEBERLING.

It has been claimed recently that a study of statistics for the last twenty-five years shows a lack of improvement in results by the closed method of reduction for congenital dislocation of the hip, and for this reason the opinion has been expressed that hope of future improvement is to be looked for in open operation. Experience in the orthopedic clinic of the Allegheny General Hospital leads my associates and me to differ emphatically with such an opinion. On the contrary, it has convinced us that when the condition is treated early, open reduction is rarely necessary. Hence, we believe that hope of future improvement lies in earlier recognition of the dislocation.

In other congenital deformities, such as clubfoot, orthopedic surgeons are now in general agreement that both functional and anatomic results are vastly better when treatment is begun as soon as possible after birth; that is, before structural adaptation to the deformed position through growth has taken place. Why any different position should be taken with reference to congenital disclocation of the

hip is hard to understand, for it is this same structural adaptation through growth which makes the reduction of the congenitally dislocated hip progressively more difficult. When the condition is recognized early, so that treatment can be begun before, or at least soon after, the beginning of weight-bearing, reduction can be carried out without traumatism, harmful muscular tension is absent, and the possibility of securing a perfect anatomic joint through growth is greatest. Our results in patients treated at this early age have been uniformly satisfactory.

One obstacle to early treatment has been the unfortunate early teaching, of which the influence still remains, that treatment must be delayed for hygienic reasons until sphincter control has been acquired. This is unnecessary as well as unwise, for while it is true that a plaster cast soon becomes soiled, the Feiss brace makes it possible to care for even the youngest infant in an entirely cleanly and satisfactory manner. The chief obstacle, however, lies in our failure as a profession to recognize the importance of this condition and to examine for it as a routine. A campaign of education is necessary. All children born in hospitals should have the benefit of examination by the hospital orthopedic surgeon as a part of the regular routine. When this is not possible, obstetricians should train themselves to carry out the simple details that are required. On pediatricians, particularly, as well as on the general practitioner, devolves the duty of being alive to the importance of this disability and to the necessity of searching for it as a routine.

The signs and symptoms of congenital dislocations may be divided into (*a*) those found before the child walks:

1. The pelvis is wider than normal.

2. There is a deeper fold in the groin.

3. The greater trochanter feels higher and more posterior than normal.

4. There is a failure to feel the head of the femur on palpation over the femoral artery on the affected side.

5. The femoral head can be felt in an abnormal position by rotating the femur.

6. There is excessive mobility of the head when the femur is pulled down strongly and allowed to "ride up."

(*b*) After the child walks, in addition to the former:

1. Marked limp if a single dislocation is present and a waddle, if there is a double dislocation.

2. The deep lumbar curve with double dislocation.

3. The presence of the Trendelenberg sign, i. e., failure to sustain the buttock on the affected side when the patient stands on that leg.

4. Measurements, the affected limb being shorter when measured from the anterior superior spine to the tip of the inner malleolus.

4. Absence of pain.

6. Roentgenograms, which confirm the diagnosis.

POSTURAL DEFECTS. MISS JESSIE WRIGHT.

The subject of posture has been covered so thoroughly in the past few years that it seems worth while only to review two essential factors:

The first is correct breathing. Breathing should be accompanied by proper abdominal retraction, emphasized particularly during inspiration, so that the abdomen is braced as the normal downward excursion of the diaphragm takes place. In the course of training, the children are taught gradually to count, recite or sing in order to discourage exaggerated respiration by forming the habit of natural and correct breathing, retaining the desired abdominal tone.

The second is a simple and effective way of helping to overcome postural knock ankle or tendency to flatfoot with compensating knock knee. The most apparent action is outward twisting of the knees to transfer the weight from the inner sides of the feet to the outer sides. The actual control of this corrective

maneuver is in the outward rotators of the hips, especially the gluteus maximus and pyriformis, the action of which adjusts the axis of the legs so that the weight is distributed easily to the outer borders of the feet, without necessitating an unusual play of the muscles of the knees and feet. The correct position of the feet may be strengthened by action of the tibials on the inner longitudinal arches and by curling the toes to favor the metatarsal arches.

The combination of these two factors forms a dependable foundation in the average simple case of poor posture.

If the weight of the body is distributed to the outer borders of the feet, if respiration is performed correctly with bracing of the abdomen, it is easy ordinarily to keep the chest forward, the head erect, and the chin level — thus placing all of the important postural points simultaneously in a functional position of advantage.

OSTEOGENESIS IMPERFECTA. DR. J. M. KING.

Osteogenesis imperfecta is the name given to a disease characterized by a defect in the evolution of the osteoblast and recognized clinically by defective ossification of the cranium, blue sclera, otosclerosis and a multiplicity of fractures resulting from trivial causes. Cases have been reported in the literature for more than a century under various titles such as fetal rickets, idiopathic fragilitas ossium and osteopsathyrosis. At first it was believed that it was incompatible with life and that the subject of it was still-born or died within a few minutes of its birth. Then other cases were described in which fragility of the bones developed later in life, so that now authorities ordinarily describe four clinical varieties: (1) the fetal form; (2) that in the infant; (3) in the child or adolescent, and (4) that in middle or later life.

I shall discuss here chiefly the fetal and infant forms, except for a brief description of the other two types.

TYPE 1.—Patients with the fetal type are mostly still-born or survive only a few days. They usually show a large number of fractures of all the long bones, some of which are united in poor position. The skull is usually little more than a membranous bag. The sclerae are blue. There are no cases reported in this group in which the child has reached adolescence.

TYPE 2.—The infantile variety is a less severe form than that seen in the fetal type. Fractures occur from trivial force at birth or shortly afterward. The cranial vault is better developed than in the fetal type, but it is still imperfect. The patients usually die within a year or two, but if they survive to adolescence there is a tendency for the bones to become less fragile.

TYPE 3.—The variety occurring during childhood and adolescence is quite different from the fetal and infant type. Usually at birth nothing abnormal is noted. The only cranial abnormality may be late closing of the fontanels. However, fractures occur from trivial causes, usually not until the child is walking. Here, too, there is a tendency for the fragility of the bones to decrease with maturity.

TYPE 4.—The occurrence of the disease in middle age or old age is quite rare. But here, again, one is led to believe that the disease was begun in intra-uterine life.

In all the types, there is a definite triad which is familiar. The triad consists of brittle bones, blue sclera and otosclerosis. Otosclerosis was first associated with osteogenesis imperfecta by Vander Hoeve and Klinge in 1916, but apparently it has not yet been given recognition except by the otologists.

Histologically, there is almost a complete absence of osteoblasts. Cartilage cells are formed from periosteum rather than the osteoblasts.

Numerous autopsies have revealed no definite pathologic change in the glands of internal secretion.

In P. E., the condition was present at birth. The cranial vault was little more than a membranous bag which almost immediately assumed the outline of anything on which it rested. The sclerae were quite blue and prominent. The musculature

of the neck was not sufficiently strong to support the head even partially. The breathing was entirely diaphragmatic in type. The abdominal wall was distended and thin. The upper extremities of both arms showed fractures. The lower extremities presented similar deformities, except that they were more marked in the lower leg. Here there had been union at right angles so that the feet could be clapped together.

The Wassermann reaction of the mother's blood was negative. On August 20, the blood calcium was 8.43 and the phosphorus, 3.33. On August 31, the blood calcium was 10.1 and the phosphorus, 2.98.

On August 22, the breast milk showed a content of fat, 9; protein, 3.37, and calcium, 0.0184; on August 29, fat, 1.8; protein, 2.1, and calcium, 0.014.

On August 20, examination of the infant's blood showed: calcium, 8.43 and phosphorus, 3.57. On August 31, the calcium was 7.3 and the phosphorus, 2.08. On September 12, the calcium was 8.56 and the phosphorus, 3.22.

Plaster splints were made at once for the arms and legs, the gross deformity of the tibias being corrected at the same time. This apparently caused no particular pain. The child was placed on phosphorus, 1/300 grain three times daily. Five grains (0.3 Gm.) of calcium lactate three times daily, cod liver oil, and sunlight and lamp treatment were given. To facilitate handling, anterior and posterior plaster shells for the entire body and extremities were made. This enabled the nurse to pick the child up as one would a huge sandwich. A plaster mold from a normal infant's head was made, which maintained the shape of the head. The child was twice given a transfusion of 45 cc. of blood.

On September 12, despite scientific reasoning, the administration of 1/10 grain (0.006 Gm.) of thyroid substance and 1 grain (0.06 Gm.) of thymus was begun three times daily.

On August 25, the measurements were: right arm, 14 cm.; right leg, 13.5 cm.; left arm, 14.5 cm.; left leg, 13 cm.; right um., 17 cm.; left um., 16 cm.

On October 17, the right arm measured 14.5 cm.; the right leg, 14.5 cm.; left arm, 15 cm.; left leg, 14 cm.; the right um., 18 cm.; the left um., 17 cm.

The infant died at the age of 10 months of pneumonia. At the time of death, the cranium had definitely hardened. The sclera appeared less blue. The diaphragmatic type of breathing was still present. The infant had shown a slow but persistent gain in weight, weighing 8 pounds (3,628.7 Gm.) shortly before death. It appeared well nourished. Roentgenograms taken at frequent intervals revealed no new fractures since the third week of life.

The second case I will summarize as of the fetal type.

The points summarized are true of the second case.

1. These cases differ from other cases in that both the calcium and the phosphorus contents are low. Other cases have shown a low normal.

2. No new medical treatment has been introduced, with the possible exception of transfusion and the early and continuous use of calcium, phosphorus and sunlight.

3. Orthopedically, the treatment is unorthodox. Deformity has been preferred to bone atrophy.

4. The plaster shells have facilitated handling.

The second patient, aged 3 years and 3 months, was of Italian parentage. The father was tuberculous; the mother was quite ill with toxemia during pregnancy. The infant was breast-fed until she was 9 months of age.

The first fracture occurred at the age of 6 months; then fractures occurred continuously until she was first seen in September; at that time, the calcium was 7.1; the phosphorus, 2.1. At the present time, the calcium is 13.2 and the phosphorus, 4.9.

LUNG SUPPURATION. DR. ELLEN J. PATTERSON.

Since it would be impossible to cover the subject of lung suppuration thoroughly in the limited time allotted to me, I have selected children illustrating some of the types of lung suppuration which were encountered in children in the bronchoscopic clinic and the results obtained by repeated bronchoscopic aspiration.

I assume that pediatricians are interested in the subject as applied to children, and all my remarks will refer to the condition as it is found in children.

The usual causes of lung suppuration in children are aspiration of foreign bodies, especially of the vegetal type, infections and conditions caused by tonsillectomy. The vegetal foreign bodies which are commonly encountered in children as a cause of lung suppuration are nuts, especially peanuts, beans, seeds, maize (corn) and grasses.

Metallic foreign bodies cause suppuration only after a long sojourn.

A considerable proportion of cases follow medical conditions of infectious origin, notably bronchopneumonia.

Lung suppuration may follow tonsillectomy, occurring one week or more after operation. It may be due to a foreign body like a deciduous tooth aspirated during operation, and there may be a combination of a tooth and infection from the tonsil.

Lung suppuration may be acute or chronic.

The initial symptom of all cases in which a foreign body is present is choking and gagging, and this initial symptom is frequently followed by a symptomless interval of hours or days. This symptomless period frequently proves to be misleading in diagnosis.

The parents, sometimes ignorant of and sometimes forgetting the aspiration of the foreign body, fail to bring it to the attention of the physician, and sometimes the history is discounted by the physician because of the complete absence of symptoms for days following the initial choking and gagging.

Following the symptomless period, the child suddenly develops an elevation of temperature and physical signs simulating bronchopneumonia, and the diagnosis of pneumonia or bronchitis is made. This attack subsides, and after another symptomless period of two or three weeks the child develops another attack of what is diagnosed as bronchopneumonia. Prolonged bronchial obstruction by a foreign body is followed by atelectasis, bronchiectasis and abscess of the lungs, usually in a lower lobe. The symptoms may suggest tuberculosis, but this disease should be readily excluded by the basal unilateral site of the lesion, the absence of tubercle bacilli in the sputum and roentgenographic study.

Lung suppuration in children is accompanied by cough which is frequently paroxysmal in character and usually unproductive. Small children do not, as a rule, expectorate. Occasionally a child is encountered who will expectorate foul pus. The breath frequently has an odor.

Acute lung suppuration in children is accompanied by elevation of temperature, sweats, loss of weight, even to emaciation, leukocytosis and symptoms of toxemia.

In suppurative disease of the lung, bronchoscopy is a valuable means of diagnosis, as it will give information as to the location of the lesion and the particular part of the lung and lobe involved; by determining the amount and character of the pus and the condition of the bronchi in the affected area, one can obtain an idea of the process.

Bronchoscopy is sometimes required to determine the mere presence or absence of suppuration in pulmonary disease.

Drainage of any focus of pus anywhere has been the best treatment since the days of Hippocrates.

In addition, in a case of lung suppuration, there is not only obstruction to drainage but there is impaired ciliary action because of the swollen condition of the mucosa. Swelling of the mucosa not only diminishes the lumen of the bronchus, causing stenosis with consequent obstruction to drainage, but swelling of the mucosa obliterates (by submerging) and impedes the ciliary action, and in the presence of suppuration the cilia are often destroyed.

The two chief factors in natural drainage of the lung are cough and ciliary action. Hence, cough remains the chief factor.

The patient coughs long and hard, but it is ineffectual because the ciliary factor is disabled.

Foul odor to pus and discoloration of pus are an index of stagnation. If pus was expectorated as soon as it was formed, it would be laudable pus. The foul

odor indicates that saprophytes have had time to decompose it, and the dark color indicates that chromogenic bacteria have had time to discolor it.

In some cases, it has frequently been noted that one of the first results of bronchoscopic drainage is the disappearance of odor.

CASE 1.—A. C., a girl, aged 8 years, was referred by Dr. H. M. Woelfel, with a history of a loose cough for years, which was worse in the morning with expectoration of pus. Examination at the Tuberculosis League in the summer of 1924 revealed no evidence of tuberculosis, and there was no history of aspiration of a foreign body.

On Oct. 22, 1924, the child was admitted to the Presbyterian Hospital for bronchoscopic drainage of lung suppuration at the base of the left lung. She had twelve bronchoscopies, without anesthesia, the last in November, 1926. Culture of pus from the left bronchus showed streptococci. Previous to treatment the child was incapacitated, but since November, 1926, she has had no cough, her general condition is good and she is able to attend school regularly.

CASE 2.—J. S., a boy, aged 2 years, was referred by Dr. D. H. Boyd, with the following history:

On Aug. 1, 1927, the child, while playing in the yard with a piece of bread in his hand, fell, and choked. He immediately became croupy but recovered the next day. Two days later, the temperature suddenly rose to 104 F.; pneumonia developed, and he was ill for three weeks. After a period of three weeks during which the temperature was normal, he took cold with an elevation of temperature and cough in severe paroxysms.

On October 22, he was admitted to the Allegheny General Hospital, where he had nine bronchoscopies, without anesthesia, the last one being performed on Feb. 3, 1928. At the first bronchoscopy, I removed fragments of peanut from the bronchus of the lower iobe of the right lung. This child has been well since April, 1928.

CASE 3.—M. C., a boy, aged 5 years, was referred by Dr. W. J. Fetter, for bronchoscopic drainage of suppuration of the left lung, following an attack of pneumonia.

On Dec. 18, 1927, on admission to the Allegheny General Hospital, the child was emaciated and had a right dorsal scoliosis, total with some rotation; he seemed too weak to sit up, and when he did attempt to sit up his head fell on the chest; he had a severe cough, paroxysmal in character, an elevation of temperature, and no appetite. The odor was so offensive that he had to be isolated.

Fifteen bronchoscopies were performed, without anesthesia, the last one on June 29, 1928. There was little odor after the first bronchoscopy. Culture of the pus from the bronchus showed streptococci and *B. influenzae*.

In this case I found no peanut, but a history of the child having had peanuts was elicited from the parents after he had been under treatment.

This child is well; he does not cough; the back is straight, and he has gained in weight.

CASE 4.—B. J., a boy, aged 6 years, was referred by Dr. H. C. Flood, with a history of cough since he had had pneumonia at 2½ years. The cough was paroxysmal in character and was accompanied by expectoration of thick yellow pus.

This child has had six bronchoscopies, without anesthesia, and is still under treatment. Culture of pus obtained from the right bronchus shows streptococci. His cough has improved, and he has gained in weight.

CASE 5.—H. K., a boy, aged 2 years and 3 months, was referred by Dr. Arthur Barnhart, Youngwood, Pa., with the following history:

On May 9, 1928, the mother gave the child cooked white navy beans to play with. He chewed the beans, choked and coughed, but, with the exception of a slight cough, seemed normal for several days. He suddenly became ill, with a temperature of 104 F., croupy cough, vomiting, loss of weight and dyspnea.

On May 30, on admission to the Presbyterian Hospital, the child seemed very ill. He was dehydrated, dyspneic, had a hard croupy cough, paroxysmal in character, and perspired so freely that his bed had to be changed frequently. He

was irritable, vomited all food and water, and was so toxic that the prognosis was grave.

He has had twelve bronchoscopies, without anesthesia, and is still under treatment.

At the first bronchoscopy an ounce of foul smelling pus, containing particles of bean, was evacuated from the left lung. Culture of the pus showed pure culture of *Streptococcus hemolyticus.*

There was little odor after the first bronchoscopy, and the child is gaining steadily.

These cases serve to demonstrate that bronchoscopic aspiration in children with lung suppuration is a safe procedure if done without anesthesia by a trained bronchoscopist. Bronchoscopy per se is followed by no reaction aside from the condition for which the bronchoscopy is done.

The pediatrician can tap, look and listen on the outside; the roentgenologist can look through the patient; the bronchoscopist can look at the lesion inside the lung. With proper cooperation, we have here a team that will work out the best possible end-results for the patient. It seems scarcely necessary to add that, except in cases of aspiration of a foreign body, the bronchoscopist is merely an assistant whose aid is sought when it is needed to contribute to diagnosis or treatment. It would be utterly unjustifiable for him to undertake alone the diagnosis of and the treatment for lung suppuration.

AN UNUSUAL CASE OF INTUSSUSCEPTION. DR. CARL RUDER.

L. N., a negro boy, aged 3 years, was admitted to the service of Dr. Z. R. Scott on Sept. 7, 1928, because of vomiting and abdominal pain of ten days' duration.

The boy had been well in the past with the exception of pneumonia two years before admission, mumps ten months before and chickenpox four months before. The family history was unimportant. The mother had had five other children, all of whom are living and well.

Ten days before admission the patient had diarrhea, with slight discomfort. At this time he had from three to five stools daily, usually black or green in color; no frank blood was seen. He was given castor oil, a senna preparation and several drops of turpentine; the diarrhea cleared up within three days.

With the cessation of the diarrhea, the abdominal pain became acute and the child vomited several times. For the next three days the pain continued, and vomiting occurred about four times daily, but only when solid food was taken. Pain was apparently localized in the region of the umbilicus and was relieved by vomiting.

For the next three or four days, he was given only orange juice and ice cream and showed marked improvement. The day before admission, solid food was again tried with the subsequent reappearance of all symptoms. Vomiting had not been of a projectile nature. The vomitus was green and never contained any blood. For several days the parents had noticed a "knot" rise in the abdomen when pain began, which receded when vomiting relieved him.

The bowel movements had been regular; there had been two stools of normal appearance daily since the diarrhea was checked seven days before admission. There was no bowel movement on the day of admission. He had had no fever.

On physical examination, the patient was found to be fairly well developed and nourished. He was mentally alert but very quiet. The skin was dry and clear. The head, eyes, ears, nose and throat were normal. The tongue was covered with a thick white coat and was very dry. The chest showed a marked rachitic rosary and Harrison's groove. The heart and lungs were normal. On inspection, the outline of a long tumor mass across the upper part of the abdomen was immediately seen. This was firm to palpation but not acutely tender. It was slightly movable and dull to percussion. Peristalsis was increased, and gain evidently occurred in waves with peristalsis. There was no muscle rigidity nor any localized tenderness. The testicles were undescended. The long bones showed some bowing, and there was some epiphyseal enlargement. On rectal examination no masses

were felt, but the examining finger was bloody when withdrawn. The result of a small simple enema was little fecal material with some bright red blood.

A diagnosis of intussusception was made, and the patient was transferred to the service of Dr. W. O'Neill Sherman. Operation was performed by Dr. G. V. Foster. Through a right rectus incision it was found that about 12 inches (30 cm.) of ileum had invaginated, pulling the appendix up into the cecum. This was easily reduced, the bowel being in good condition. The incision was closed with catgut, and the patient was returned to the ward in good condition where he was given 500 cc. of physiologic solution of sodium chloride subcutaneously.

Recovery was uneventful. The patient was discharged after twelve days.

This case is interesting because of: (1) the duration; (2) the length of the intestine involved; (3) the absence of shock, and (4) the fact that the diagnosis was made almost entirely by simple inspection of the abdomen.

HYDROCEPHALUS. DR. RALPH ROBINSON.

A boy, aged 5 weeks, was admitted to the Children's Hospital on May 30, 1927, at which time the parents noticed that his head was gradually becoming larger.

On admission, the circumference of the head was 16¾ inches (42.4 cm.) the chest 13½ inches (33.7 cm.) and the abdomen, 12 inches (30.4 cm.).

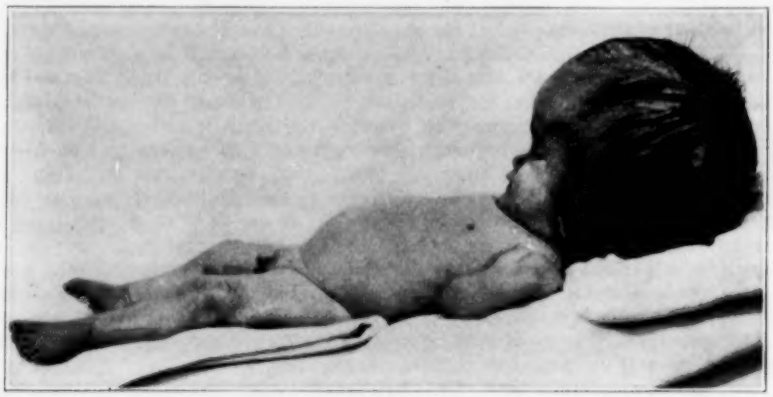

Fig. 2.—Appearance of infant with hydrocephalus.

On physical examination, the boy was fairly well nourished but poorly developed. The fontanels were bulging and tense, and the sutures were widely separated. The spleen was slightly palpable; the rest of the examination was essentially unimportant.

The head increased in size and on November 19, the circumference was 28½ inches, while the length of his body was 26½ inches. His general condition showed no change; he took his feedings well until Feb. 28, 1928, when his temperature became elevated and ranged from normal to 102 F.

On April 26, 1928, about one year after admission to the hospital, his head measured 29½ inches (75 cm.) in circumference and the length of the body was 27½ inches (70 cm.). His limbs became spastic, and his arms were rigidly flexed.

There was no improvement in his condition, and on May 25, 1928, he died.

(*A*) SPLENECTOMY FOLLOWED BY COMPENSATORY REGENERATION OF MESENTERIC LYMPH GLANDS. (*B*) PECULIAR INFECTION OF FACE AND NECK WITH ATRESIA OF MOUTH AND ESOPHAGUS. DR. E. W. MEREDITH.

(*A*) In January, 1925, a boy, aged 14 years, was injured in a coasting accident; he was thrown from his sled, striking the left side of his body against a tree. He complained of some pain but was able to walk home. Several hours later, he

vomited. Eight hours later, he passed bloody urine. He was admitted to the hospital about fifteen hours after the accident, at which time he showed all the signs of a severe internal hemorrhage. The abdomen was distended and somewhat rigid. The urine showed blood. Diagnosis of a ruptured spleen and ruptured kidney was made, and laparotomy was immediately performed. A large rupture of the spleen was found, and the spleen was removed. The rupture of the kidney was not sufficient in extent to warrant doing anything to it. The patient made an excellent recovery and left the hospital on the sixteenth day.

Three years later, in May, 1928, he was operated on for subacute appendicitis. When the abdomen was opened, a striking condition was noted. Scattered throughout the mesentery of the small intestine and the fat tabs of the colon were innumerable dark red bodies, resembling the spleen in color and varying in size from that of a lima bean to that of a millet seed. One of the larger of these hemolymph glands was removed for microscopic examination. This compensatory change in the reticulo-endothelial system has been noted by other observers on the occasion of performing a laparotomy subsequently to a splenectomy.

Griffin stated "that hyperplasia of lymphatic tissues has been seen occasionally during life, and has been definitely found post-mortem following splenectomy in men." Paltin and Stubenrauch found at the time of second laparotomies, performed one and six years, respectively, after the first operation, that the peritoneum was covered with numerous nodules, microscopically showing the characterizations of splenic tissue, which certainly had not been present at the first operation. Moynihan reported a personal case, in which a small accessory spleen, after a period of seven years, increased almost to the size of a normal spleen. Lee described a case in which a laparotomy was performed for acute intestinal obstruction on a splenectomized patient, and he found the peritoneum covering the small intestine and mesentery covered with small tumors, varying in size from that of a pinhead to 1 by ½ inch (2.5 by 1.2 cm.); there were from 200 to 300 such tumors, and on microscopic examination they were found to be of splenic tissue. It is therefore clear, to a certain extent at least, that after splenectomy the functions of the spleen are taken over by remnants of splenic tissue left at operation, accessory spleens and the rest of the reticulo-endothelial system, all of which show hypertrophy. In a case of apparent congenital absence of the spleen, Hodenpyl found a general compensatory lymphatic hyperplasia at autopsy.

Late deleterious effects of splenectomy on health are apparently absent, and if present, they are, for practical purposes, negligible.

A slight anemia that lasts for years associated with a slight leukocytosis follows splenectomy. The blood count was as follows: red cells, 4,800,000; hemoglobin, 88 per cent; white blood cells, 15,000, 15,500, 14,800 and 13,600.

(*B*) J. S., a boy, aged 4½ years, was admitted to the Children's Hospital on Sept. 18, 1925, complaining of a sore mouth. Examination showed a grayish colored exudate on the buccal mucous membrane. The pharynx was reddened but showed no typical membrane. Examination was difficult on account of lack of cooperation. A smear and swab were taken for culture, both of which were negative. Under medication, the stomatitis cleared up, and the child was discharged at the end of seventeen days.

Twelve days after discharge, he was readmitted with an extensive gangrenous stomatitis and dermatitis involving the entire buccal cavity, tongue, lower and upper lips and the entire anterior half of the neck down as far as the clavicle. The child had a high fever and became greatly emaciated, but under treatment the gangrenous area finally sloughed off, leaving a granulating surface not unlike that following a burn. This eventually healed by cicatrization, causing great deformity of the mouth and neck. Shortly after this, difficulty in swallowing was noted. Roentgenograms were taken, and multiple, partial strictures of the esophagus found. Gastrostomy was then done. On account of the cicatricial contractions of the mouth cavity, it was impossible to pass in an esophagoscope.

The cicatricial contraction between the chin and the chest wall was remedied by plastic operation. The patient is not able to swallow liquids. A gastrostomy tube has been removed, and the gastrostomy opening is almost healed. Gradual

improvement is taking place in the buccal cavity. The sulcus between the cheek and the alveolar border of the lower jaw is gradually improving on the lateral aspects of the mouth, but the attachment between the lower lip and the alveolar border is permanent and cannot be relieved except by operation. The mouth can be opened much better than it could be formerly.

PAPILLOMAS OF THE MOUTH IN INFANCY. DR. E. W. STEVENSON.

CASE 1.—N. B., a girl, aged 1 year, was admitted to the hospital on Sept. 25, 1928, with the complaints of growths in the mouth and a hoarse cry.

On July 25, 1928, some small growths were discovered in the patient's mouth during a routine examination. They did not appear to have enlarged. Until she was about 5 months of age, the infant could hardly cry loud enough to be heard. The cry remained somewhat hoarse and subdued. During the first five months, the patient had a peculiar "rattle" with breathing. An attack of dyspnea occurred during the second month. The child became blue all over. The attack lasted about two hours. Three or four days later, she had a similar attack, and two weeks later, a third attack, which lasted two hours. The patient choked and appeared unable to get her breath. She became blue all over and could not cry. The last attack was in November, 1927.

The patient had pneumonia in December, 1927, and was ill for two or three weeks. She made an apparently fair recovery, but did not begin to gain until about May 1. She had a questionable ear trouble.

The family history was essentially unimportant. The child was born at full term and weighed about 5 pounds (2,267.9 Gm.). Labor was normal. There were no subsequent difficulty. She was breast-fed every three hours for four months. She nursed poorly. There was slight gain in weight. She was weaned because the mother had influenza. She was then placed on S. M. A. for two days, Mellin's food for about one week and Eagle Brand milk for about one week; she was changed back to Mellin's food for four weeks and in July, 1928, was given milk, 50 ounces (1,480 cc.), barley flour, 1 tablespoonful; water, 10 ounces (295.7 cc.); Karo, 2 tablespoonfuls. Six ounces (178 cc.) of this mixture was given every three hours seven times daily. For the last two months, the milk having been increased and the water decreased, the Karo and barley flour were discontinued until the child was receiving whole milk, 8 ounces (236 cc.) every four hours, and zwiebach, cereal, vegetables, orange juice, baked potato and apple and some broth. The child had gained since May 1, 1928. There were two or three bowel movements a day, the stools being light brown and pasty.

On physical examination, the child was well nourished and well developed. The eyes were normal. There was some discharge from the right ear; the left drum was congested. The nose was normal. There were a number of soft, wart-like growths in the throat, two of them being attached to the tonsillar area on the anterior pillars and one on the midline. The child was hoarse. Physical examination gave otherwise negative results.

The diagnosis was papilloma of the mouth, probably of the larynx.

Laryngeal examination revealed the presence of several small growths, parts being removed for section.

The urine showed acid; albumin, + and numerous pus cells. Examination of the blood showed: red blood cells, 3,460,000; white blood cells, 11,600; hemoglobin, 60 per cent; neutrophils, 39 per cent; lymphocytes, 58 per cent; large mononuclears, 3 per cent. The tuberculin test was negative. The Wassermann reaction was negative.

The diagnoses were: (1) papilloma of the mouth and larynx; (2) pyelitis, and (3) chronic otitis media on the left.

CASE 2.—C. S., a girl, aged 6 years, had had a growth on the lip and on the hard palate since birth.

There were circumscribed raised areas on the tongue. These had gradually become larger. Otherwise, the child seemed healthy. At times she had choking spells, but these were not severe. The family and past histories were unimportant.

On physical examination papillomatous growths were found on the lower lip extending back to the hard palate. These were firm, not tender and did not bleed easily. Some were also present on the tongue. Section removed for biopsy showed many papillae covered with stratified epithelium, about 20 or 25 cells thick. This epithelium rested on a core of connective tissue with thin walled blood vessels. In one part of the section could be seen lymphoid tissue and single mucous glands and also a duct lined with pseudostratified epithelium. No inflammation was present.

The diagnosis was papillomas of the soft palate. The urine was normal. Examination of the blood showed: erythrocytes, 3,640,000; leukocytes, 12,000; hemoglobin, 60 per cent; neutrophils, 71 per cent; lymphocytes, 13 per cent; large mononuclears, 5 per cent; eosinophils, 11 per cent. The Wassermann and tuberculin tests were negative.

EMPYEMA IN INFANCY. DR. ROBERT ENTWISLE.

A boy, aged 26 days, was admitted to the Children's Hospital. He had been born in another hospital, after a normal delivery. The third day after birth, the child coughed. The mother was told that he had some fever. On the fourth day, the attending obstetrician told the mother that the infant had pneumonia on the left side. The patient was somewhat fussy during the next fourteen days; he coughed and had a continuous temperature. He seemed to improve about the twentieth day, when the temperature was normal for one day only. The physical signs of empyema in this child were precisely like those of an older child, except that there was no clubbing of the fingers. The flatness, the bronchial breathing, the displacement of the apex and the limitation of respiratory movements were extremely marked. The usual type of operation was done with the resection of a piece of the seventh rib in the posterior scapular line under light ethyl chloride and ether anesthesia.

The child died thirteen days later. During the first few of these thirteen days the child's condition was satisfactory, and he seemed to be making a good recovery. On the fourth day after operation, it was noted that there was marked swelling of the right leg. This continued until death, becoming greater each day. There was never any localization of pus in this leg, and the swelling is believed to have been due to a right iliac thrombophlebitis. Shortly after the right leg became swollen, there was marked distention of the abdomen, with feeble peristaisis, but no vomiting. It is believed that death was due to these complications brought about through a septicemia. Autopsy was not performed.

The temperature on admission was 104. The white blood cells numbered 15,500 and the red blood cells, 2,800,000. The urine showed albumin. Roentgen examination revealed the presence of fluid. Laboratory tests showed *Staphylococcus aureus*.

Empyema is among the oldest known diseases. Hippocrates operated for this condition. He did an intercostal drainage with favorable outcome. Except for the advent of the aspirating needle and the x-ray, little change has come about in classic empyema from that day until 1917. Up to that time, the story was usually the same, namely, continuation of fever and physical signs beyond the expected date of recovery in both bronchopneumonia and lobar pneumonia; thus, the diagnosis was made on suspicion and was confirmed by the presence of thick pus in the aspirating syringe.

The measles epidemic of 1917 and the influenzal epidemic of 1916 were accompanied by a different type of septic pleuritis. Here, the effusion was found early, sometimes within the first forty-eight hours, and did not consist of thick pus but was the well known thin streptococcic exudate. Overnight, the age old conception of empyema changed, and simply because streptococci could be found in large numbers in this thin fluid, operation was advised and undertaken. The high mortality following this, which was due partly to collapse of the lung, brought about many grotesque ways of attempting to limit the amount of air which entered the pleural cavity. It took many months and, in places, years to get back

to the original thoughts on empyema and to appreciate the fact that these patients should never be operated on until there is a well localized and a well walled-off abscess, which condition is evidenced by thick pus in the aspirating syringe.

There is little to be said of the empyemas following lobar pneumonia and bronchopneumonia, because when they are found they are invariably ready for operation, which means the presence of a well localized abscess with adhesions so thick that the partially collapsed lung is protected from further collapse when an opening is made into the chest. In the pneumonia followed by thin pleural effusions, however, I should like to emphasize further that operation is contraindicated. Aspiration is nonbeneficial unless there is such a large quantity of fluid that respiration is embarrassed through mechanical means. To determine when this condition has arrived is one of the hardest of all things to do. Rapid respiration and cyanosis can be caused by toxicity as well as by bulk of fluid. Marked cardiac displacement plus roentgen evidence of large amounts of fluid are the best guides for aspiratory removal. After the fluid has become extremely thick one may be assured that there has been good walling-off, and the condition then becomes comparable to the empyemas of bronchial and lobar pneumonia. Open operation at this stage is safe and desirable. That negative pressure and other types of apparatus to limit the amount of air entering the pleural cavity are needed at this point is to my mind a fallacy. When one has waited for the proper time to operate on a person with empyema, he is really dealing with an extrapleural abscess with the partially collapsed lung protected by thick adhesions.

The other point is the desirability of delay in these cases. It was not so long ago that this was considered an emergency operation. Delay up to a certain point, while the abscess becomes ripe, so to speak, is undoubtedly beneficial.

I recently saw a patient who had a history and roentgenographic confirmation of empyema of five months' standing, which, at the end of that five months, ruptured into the bronchus and was then diagnosed as abscess of the lung. I merely cite this to show the length of time which some empyemas, at least, take to cause serious complications.

EMPYEMA RUPTURING INTO THE BRONCHUS. DR. J. A. RODGERS.

Neither the family nor the past medical history are of importance in this case. The chief illness began on Dec. 6, 1926, with a slight cold, malaise, aching, chilly sensations and slight temperature. For several days, the patient was cared for by her mother with the usual home remedies. Because of the complaint of pain in the right side and the increase in the severity of the symptoms, the family physician was called and diagnosed a right-sided pleurisy and right-sided lobar pneumonia.

The lobar pneumonia ran a moderately even course, except that the crisis, which was confidently looked for, did not occur; instead, the patient became worse, as evidenced by an irregularly higher temperature.

Not satisfied as to the pathologic condition present, the attending physician desired a consultation.

When the consulting physicians first saw the child on December 25, she was restless and toxic, with the usual appearance of an acute respiratory infection. Physical examination revealed diminished expansion, absent tactile fremitus, massive dulness to the point of flatness, distant bronchial breathing and increased vocal resonance of the right side. A diagnosis of right-sided lobar pneumonia with early effusion was made. As the child was comfortable and the parents objected to surgical intervention, a confirmatory thoracentesis was advised for a later date.

Nothing further was heard from this patient until Jan. 15, 1927. At this time, it was learned that the night before she was suddenly seized with a severe pain in the right side, paroxysms of coughing with expectoration, cold and clammy skin and cardiac failure. According to her mother, she coughed up "at least a teacupful of pus four or five times with smaller amounts between."

At this time the child appeared critically ill; she was lying on the right side. She was breathing rapidly, with a short expiratory grunt at the end of expira-

tion. The skin was cold and clammy; there was an easily noticeable cyanosis of the cheeks, lips, finger tips and toes. The right side of the chest was immobile and was larger than the left, with the interspaces obliterated; tactile fremitus was absent; there was dulness at the base with a hyperesonant to tympanitic note above. The breath sounds were absent except between the spine and the scapula, where they were distinctly tubular with a rather metallic note. The coin sound was positive; the heart was displaced to the right, as evidenced by an apex beat in the fifth interspace from 6 to 5 cm. to the left of the sternum. The right border was 2 cm. to the right of the sternum. Attempts to perform a succussion splash were unsuccessful. A diagnosis of spontaneous pneumothorax with rupture of the empyema through a bronchus was made and hospitalization advised.

On admission to the Children's Hospital, the patient showed: red blood cells, 3,650,000; hemoglobin, 68; white blood cells, 18,610, with polymorphonuclears, 78; small lymphocytes, 16; large lymphocytes, +; basophils, 1; eosinophils, 1. The urine was normal. The sputum was negative for the tubercle bacillus; the Pirquet test was negative. Roentgen examination showed: "Pneumothorax, right, with some fluid." "The lung is quite collapsed."

For about a week, the condition was critical, the pulse rate rising from 140 to 160; it was weak and easily comprehensible. The temperature ranged from 101 to 104 F., and the patient expectorated large amounts of pus with paroxysmal coughing. Gradually she began to improve, and her convalescence was uneventful. On admission she weighed 49½ pounds (22.4 Kg.) and on discharge, 64 pounds (29 Kg.). It is interesting to note that no surgical measures were used, that the only treatment given was rest, cod liver oil therapy, alpine lamp and fresh diet. She was encouraged to inflate balloons and various blowing devices. On discharge, she was apparently normal; the physical signs were negative, and the roentgenogram revealed the lung fully expanded.

ELECTROCARDIOGRAMS IN PERSONS WITH CONGENITAL HEART DISEASE. DR. J. M. LICHTY.

The diagnosis of congenital heart disease is sometimes a difficult problem, and certainly it is one of the most interesting with which physicians have to deal. The electrocardiogram is of more help in congenital heart disease than in any other pathologic condition. In fifteen patients seen in the cardiac clinic at the Children's and Mercy Hospitals, 50 per cent showed some electrocardiographic abnormality. Only 25 per cent of the eighty-five cases presenting other types of disease showed any significant change. Outside of the typical change found in a true situs inversus, there are no changes which aid directly in the diagnosis of the actual lesion. The common changes are in the preponderance, inversion of the P waves, slurring of the major ventricular deflections and at times changes in the T waves. At times the cardiogram is as bizarre as the clinical manifestations, but usually a logical interpretation can be made.

The cardiogram is the only certain method of differentiating a simple and usual congenital dextrocardia from a true situs inversus. In the latter the deflections in lead 1 are all directed downward, whereas in the former most any abnormality may occur. As pointed out by many observers, both of these types are seldom unaccompanied by other intracardial defects, and these may easily influence the cardiogram. Also, a congenital defect usually leaves the heart an easy prey to endocarditis of any form.

The cases presented showed the following conditions:

1. True situs inversus with all deflections inverted in lead 1.

2. Simple congenital dextrocardia with a left preponderance. These two cases are almost identical clinically.

3. A definite pulmonary stenosis in a girl, aged 11 years, showing marked right preponderance with increased amplitude and a sinus block. The child is practically symptomless, and the murmur was picked up by the school physician.

In all of these cases, there is a definite overriding of the major ventricular deflection with slight slurring at the peak. Attention was first called to this by Max Seham a few years ago, and its presence and value in congenital cardiograms are verified and emphasized.

TRANSPOSITION OF ORGANS. DR. H. T. PRICE.

This patient came under my observation in the outpatient department of the Children's Hospital when 2 months old. The history revealed that the neighbors felt that something had been wrong with the child since birth. When I saw the child, there was a definite involvement of the heart; it was located on the right side. A barium meal was given to demonstrate the position of the stomach, which was also found on the right side, but the child seemed to be leading a normal life in this condition.

ANEURYSM OF THE RIGHT INTERNAL JUGULAR VEIN. DR. J. L. FOSTER.

A boy, aged 3½ years, had right-sided cervical adenitis; the condition had been treated with radium. He had an uneventful birth and had been breast fed the first year, with much vomiting and colic. The tonsils and adenoids were removed when he was 3½ years of age; he had pertussis at 3 5/12 years and was vaccinated at 3½ years. All of this must have been a considerable strain on his physique, which, according to the mother, had at no time been considered strong.

Three months after radium therapy for the cervical adenitis, the mother noted a soft enlargement on the right side of the neck when he laughed, cried, coughed or strained. No other symptom or sign was present; the enlargement caused no pain, nor was it visible when the child was quiet.

Among diagnoses ventured by various physicians were air-sac, internal bronchial fistula, and atavism — all congenital. The only acute infection he had had was pertussis, which was not severe. At this early age, the tonsils were thought sufficiently diseased to be removed. He had not been injured; even venipuncture had not been performed for diagnosis; he did not use alcohol, and the Wassermann reaction was negative.

On examination, he was pale but very active. At both the right and the left anterior cervical regions and in the suprasternal notch, he exhibited moderate pulsation. A soft swelling the size of a hen's egg was noted when he coughed, just anterior to the right sternomastoid muscle. No bruit was noted nor was a thrill palpable. The heart rate and rhythm and sounds were normal. A slight left inguinal adenopathy was present.

A roentgenogram did not reveal the thymus. The complete blood count was normal, and the Wassermann reaction was negative.

An exploratory operation was performed by Dr. M. G. Slocum on Nov. 10, 1926, at the Pittsburgh Hospital under ether anesthesia, when the boy was 5⅔ years old.

The record of the operation as dictated at the time it was performed follows: The patient was placed in the dorsal position, with a sand bag under the neck. A 3 inch (7.6 cm.) incision was made along the inner border of the sternomastoid muscle, with the center of the incision about in the center of the muscle. The muscle was then carefully freed from the underlying structure, and a piece of cloth tube put around it as a retractor. The carotid artery and the vagus nerve were identified. A small lymph node was removed from the carotid sheath and sent to the laboratory for examination. The muscle was then retracted inwardly, exposing a thin, dark, cystic mass that beat synchronously with the heart. This mass corresponded to the internal jugular vein, and before it was dissected away from the surrounding structures, the superior laryngeal nerve was identified. By careful dissection, the sheath surrounding this structure was opened in several directions, permitting the tumor to bulge out into the wound. It was then seen that the thin walled tumor contained blood which was swirling in a rotary fashion

and which imparted a distinct thrill to the finger. Pressure on the upper end of the vessel caused it to collapse entirely. Pressure on the lower end produced marked dilatation. Contraction of this vessel produced no apparent symptoms of disturbance of respiration or circulation. No cause was seen that might have brought about obstruction of the circulation. Another small gland was removed from the depth of the wound and the wound was closed, a small piece of rubber drain being left in the lower end.

Gross Pathology.—The presence of a blood vessel tumor was not even remotely expected. The tumor was extremely thin-walled, and its color, which was blue, was imparted to it by the contained blood. The phenomenon of the blood swirling in a rotary fashion, clockwise, was distinctly observed. Thrill was also evident. The unusual feature of the case was that during deep anesthesia, the vessel was more or less collapsed and did not present any increase in its diameter but that when the patient was coming out of the anesthesia, there was a great increase in the sacular area which reached the size of a golf ball. Two small lymph nodes showed no characteristics of tuberculosis.

The pathologic diagnosis was hyperplasia of the cervical lymph nodes.

Since the child did not suffer pain, recent alarmingly increasing local distention of the vein, or signs of increasing and troublesome obstruction to the peripheral venous circulation, the wound was closed without further operative intervention. The lowest pulse rate was 88; the highest, 140; on discharge, it was 100 and now is 100.

The patient was discharged from the hospital three days later with a clean wound, and the incision healed without complication.

Careful inquiry before and after operation elicited only the positive declaration that the "come and go" swelling was not perceptible in the child's neck prior to the radium therapy. What this therapy had or did not have to do with the vascular condition cannot be proved.

The parallel of this case is practically unmentioned in the literature.

I have had the boy under my care from one and one-half years before the operation until now, two years after operation. He has had several attacks of rhinitis, one or two of bronchitis and one of glandular fever which lasted a week in December, 1927. His appetite is good; he is irritable and "bossy" about the house, but does well in school and is always cooperative when I have anything to do with him. He suffers from various periods of insomnia which are unaffected by the usual soporifics. He does not suffer from pain or dyspnea.

The swelling is about the same as before operation; I am hopeful that no discomfort may intervene nor further operative intervention be necessary.

CONGENITAL DEFECTS OF THE EARS, WITH ROENTGENOGRAMS. DR. JOHN R. SIMPSON.

The case presented is that of a girl, about 5 years old, who when 3½ years old was brought to the Children's Hospital with congenital malformations of both ears. She could hear somewhat, and on roentgen examination it was thought that the presence of an auditory canal could be determined; so, on the side that seemed to give the greater promise, an attempt was made to construct an external auditory canal and nothing was found that looked like a drum or a middle ear.

All that was accomplished was a facial paralysis. The child hears fairly well when spoken to with a loud voice, and there is now almost complete disappearance of the paralysis of the face. She now goes to school, is acquiring a vocabulary and speaks quite distinctly. It will probably be necessary to send her to an institution for the hard of hearing in order that she may gain an education.

The lesson to be learned from this experience is: "When contemplating operation for the correction of a congenital malformation, it is well to consider that other structures may be in mal-position."

INFECTIONS OF THE EAR IN INFANTS. DR. K. M. DAY.

In 166 patients under 14 months of age, the results were: 1. Infection of the ear was found in 38 per cent of the nutritional cases and in 34.5 per cent of the general cases. 2. Thirty-five per cent of all the patients showed infections of the ear. 3. The average duration of the discharge was nine days. 4. Operation was performed on the mastoid in three nutritional cases, with improvement in one. 5. Twenty-five per cent of the infections of the ear were found in infants with normal temperatures.

I believe that too many mastoid operations are being performed on infants, in many of which the condition would possibly clear up with proper drainage of the middle ear, obtained by wider incision of the drum.

The infant ear drum is in quite a different position from that of the adult. The upper segment of the infant drum is a continuation of the superior canal wall, and it is necessary to incise this segment in order to insure drainage from the upper part of the middle ear and from the antrum.

The upper part of the middle ear is frequently blocked off from the lower part, because of the presence of ossicles and the surrounding embryonic tissue.

Mastoid operations should be limited to those cases showing frank mastoid signs, and those in which prolonged treatment of the middle ear fails to clear infection or in which repeated incisions are required.

A good maxim is: More radical measures in incising ear drums and more conservation in opening mastoids.

Program for Saturday Morning, Oct. 27, 1928

Wheezing Respiration in Children: Bronchoscopic Observations on Stridulous and Asthmatoid Breathing. Dr. Chevalier Jackson.

Cirrhosis of the Liver in an Infant, Aged One Year. Dr. J. K. Everhart.

Dermatitis Exfoliativa. Dr. Stanley Crawford.

Talipomanus. Dr. T. O. Elterich.

Dental Facts of Interest to the Pediatrician. Dr. H. E. Friessell.

Congenital Hypospadia in a Girl with Endameba Infestation of the Bladder. Dr. Ellsmer Piper.

Acute Rheumatic Fever with Unusual Condition of the Blood. Dr. D. H. Boyd and Dr. G. R. Lacy.

Severe Anemia in Infant Due to Malarial Infection of Unusual Origin. Dr. E. W. Willets.

Rare Atrophic Condition of the Skin. Dr. Guy Harvey.

Pericarditis. Dr. H. C. Flood.

Types of Diabetes. Dr. Z. R. Scott.

Congenital Intestinal Obstruction of the Jejunum. Dr. J. H. Wagner.

Congenital Anomaly of the Intestinal Tract. Dr. E. R. McCluskey.

Heart Block and Complications. Dr. J. D. Iams.

WHEEZING RESPIRATION IN CHILDREN: BRONCHOSCOPIC OBSERVATIONS ON STRIDULOUS AND ASTHMATOID BREATHING. DR. CHEVALIER JACKSON.

The wheezing to which these observations refer is that heard at the open mouth of the patient, not by auscultation through the chest wall.

The Mechanism of Wheezing Respiration.—When the lumen of all the air passages is of a normal area of cross-section, a child breathes so quietly that either close approach or the observation of movement is necessary to make certain that he is breathing at all.

To produce a wheezing sound audible without ausculation, the lumen of the airway must be encroached on by tissues, secretions or a foreign substance.

The sound may be described as wheezing, rattling, bubbling, crowing, harsh, whistling, vibratory, stridulous or merely noisy.

The sound may be heard on inspiration or expiration, or on both.

The character of the obstruction to the free noiseless passage of air can be determined in practically every case by tripartite conference of the pediatrician, who can tap, look and listen on the outside, the roentgenologist, who can look through the patient, and the broncho-esophagoscopist who can look inside the patient.

Compression Stenosis.—Compression stenosis may be due to any structure or foreign body outside the tracheal or the bronchial wall.

A foreign body in the esophagus, as mentioned elsewhere here, may compress the trachea by its bulk or by the secondary swelling, or by both.

Thymic compression stenosis is a cause of wheezing well known to all pediatricians. Twenty years ago, John Boyce and I bronchoscopically demonstrated thymic compression stenosis in the living patient, disproving the arbitrary dictum of Friedleben that such a thing did not exist and was impossible.

Substernal goiter, sometimes congenital, is not so common a cause of compression stenosis and wheezing in children as thymic compression, but there have been a number of cases of this kind at the Bronchoscopic Clinic.

Adenopathy is relatively common in our records as having caused a wheeze mistaken for asthma. The most common site is at the bifurcation of the trachea. Either the right or the left bronchial orifice, or both orifices, may be included.

Cicatricial Stenosis.—Cicatricial stenosis has been found as a cause of wheezing respiration, in a number of our cases, and it usually led to an erroneous inferential diagnosis of asthma until the bronchoscopic examination revealed the actual condition. The cause of the cicatricial stenosis was not always clear. In some instances, it was clearly due to the suppuration through of a mediastinal gland. In other cases, it was due to prolonged sojourn of a foreign body. In a few cases there had evidently been a prolonged suppuration, abscess or bronchiectasis. Syphilis and tuberculosis were each found to have been causes of the previous suppurative condition, but acute infections seemed to have been more frequently the cause.

The Asthmatoid Wheeze.—One of the most important diagnostic signs of foreign body in the tracheobronchial tree is a wheezing respiration heard at the open mouth. If a child has choked and gagged and this is followed by a wheeze, it is absolutely certain that a foreign body is lodged somewhere. If the wheeze disappears, it is more often due to the foreign body having gone deeper into the bronchi than to expulsion of the intruder.

Many patients with supposed asthma have come to the clinic wheezing because of a foreign body in the esophagus. The obstruction to the lumen of the airway may be by compression due (*a*) to the bulk of the foreign body; (*b*) to the compressive swelling around the foreign body; (*c*) to laryngotracheitis and subglottic edema from overflow of food or secretion, or (*d*) to ulceration of the foreign body through the party wall from the esophagus into the trachea. A number of unfortunate patients who have been under treatment for prolonged periods for supposed asthma have come to the clinic suffering from the presence of a foreign body, the removal of which promptly cured the wheeze.

Acute infective laryngotracheitis is often a cause of wheezing and dyspnea. In the acute cases, it symptomatically resembles diphtheria; but in the residual chronic form associated with chronic subglottic edema, it has produced a wheeze thought to be asthma.

Wheezing thought to be due to asthma was the erroneous diagnosis in twenty-seven cases of papilloma at the Bronchoscopic Clinic. In some of the cases the papillomas were in the trachea, but more often they were in the larynx.

The presence of thick pus in the bronchi in some patients produces a wheeze simulating that of asthma. In many such cases, bronchoscopic aspiration and inspection have entirely eliminated any element that could possibly be called

asthmatic. In some instances, granulations obstructing the bronchi produced a pronounced wheeze after the pus was aspirated. In some cases, cicatricial stenosis from healed areas was a factor in the production of the sound.

What has just been said of pulmonary abscess is equally true of bronchiectasis.

Asthma.—Asthma is placed last on the list, not because it is the least frequent, but for the purpose of emphasizing the bronchoscopic point of view that it should be a last diagnosis to be reached. All the experiences of the bronchoscopic clinic go to show that the diagnosis of asthma should not be made until all other possible causes of wheezing respiration have been excluded. My associates and I may be biased, but we feel that this can be done with certainty only by objective examination of the airway. All other diagnostic methods should be preliminaries to the bronchoscopy.

"All is not asthma that wheezes" is an aphorism that I think should be inculcated into every medical student so that in his after life he would be on the alert for the causes of wheezing that not only are often serious and fatal if overlooked but are quickly and easily curable if discovered.

There is no bronchoscopic evidence of spasm of the bronchi in asthma or in any other disease. This does not mean that no spasm exists in asthma, but simply that bronchoscopic examination during an attack of asthma affords no objective evidence of spasmodic contraction of the bronchi. I cannot say that no spasm occurs in the minute peripheral bronchi into which the bronchoscopist cannot look; but if spasmodic contraction occurs there in asthma, as a physicist I cannot understand why a wheeze audible at the mouth should be thereby produced or why bronchoscopic aspiration should stop the wheeze. On the other hand, pathologic states of the mucosa are the rule in all cases.

The most frequent pathologic condition found is clogging of the bronchial orifice or bronchial lumen with pus, or mucopus. During an attack the mucosa is, in many instances, red or crimson; sometimes it is livid or cyanotic; it is always congested.

The secretions in asthma are typical. They are thick and tenacious in consistency; strong negative pressure is required to pull them out. They are obviously the cause of the wheezing and coughing and of the patient's distress. When they are bronchoscopically aspirated, the patient is relieved until they reaccumulate. They clog the cilia, and the cough combined cannot expel them.

In patients seen at the Bronchoscopic Clinic of the Graduate Hospital of the University of Pennsylvania, Dr. John Kolmer has shown that the intense viscosity of the pus resulting in massive coagulation of the pus is due to an access of fibrin. This is secondary to an excess of fibrinogen derived in excess from the blood during passive congestion.

What causes the passive congestion I do not know, but hundreds of cases at the Bronchoscopic Clinic afford evidence as to this secretion being the cause of the wheeze, the dyspnea and all the other respiratory symptoms of asthma.

Conclusions.—1. All is not asthma that wheezes.

2. If a patient wheezes, there is always some obstruction in the larger air passages.

3. Most often the obstruction is due to a foreign body; next in frequency is secretions difficult of expulsion.

4. Obstruction in the smaller bronchi does not cause a wheezing sound audible at the open mouth.

5. Bronchoscopic examination will practically always reveal the mechanical cause of wheezing.

6. Cooperation of the pediatrician, who can tap, look and listen on the outside, the roentgenologist, who can look through the body, and the broncho-esophagoscopist, who can look inside the patient, usually solve all diagnostic problems in which pulmonary symptoms are concerned.

CIRRHOSIS OF THE LIVER IN AN INFANT, AGED ONE YEAR. DR. J. K. EVERHART.

L. P., a girl, aged 13 months, an only child, was brought to the outpatient department because of yellowish discoloration of the skin of the entire body. The mother said this discoloration had been noticed first about two and one-half months previously, and to her it seemed no worse than when first seen. The previous health had been good, and the child had seemed to thrive and to grow normally.

For three months, she had been breast-fed. Then she was put on Eagle Brand milk, which was continued to the time she was brought to the hospital. She also had been given cereals and vegetables until the present trouble was noticed, when, on the advice of a physician, they were discontinued. She took all feedings well. There was no vomiting. For a time the stools had been usually light, but at the time of admission they were yellow.

The infant was apparently overdeveloped, although a moderate edema of the superficial tissues and ascites helped to account for her weight of 29 pounds 6 ounces (13.3 Kg.). The fontanel was closed. The sclerae and skin were stained deeply yellow. Six teeth had erupted. There was no clinical evidence of rickets. No lymphatic enlargement was detected.

The abdomen was abnormally large, with prominent superficial veins. Free abdominal fluid could be demonstrated. Neither the liver nor the spleen was palpable. Twenty-five cubic centimeters of clear, light yellow fluid was withdrawn from the abdomen, which gave a positive test for bile.

The abdominal distention increased from day to day. After several days the child presented evidence of pleural effusion, and the day before she died 850 cc. of serous, yellow fluid was aspirated from the pleural cavity.

She died on the eighteenth day after admission, with a known duration of the disease of three months.

No definite diagnosis was established ante mortem, although it was thought that perhaps the condition was carcinoma of the liver.

At autopsy, the abdominal cavity was emptied of about 1,000 cc. of clear, yellow fluid.

The spleen weighed 85 Gm., was normal in shape and was a dark reddish brown. Section showed almost complete disappearance of lymphoid tissue.

The pancreas was yellow and firm. The island tissue and islet cells were fairly numerous and showed no congestion.

The kidneys weighed 140 Gm. and were normal in size and shape. The capsule stripped easily. Section showed marked tubular lesions. Everywhere the tubular epithelium was swollen and degenerated. The glomeruli appeared fairly normal.

The suprarenals showed slight degeneration of the cortical cells.

The liver weighed 230 Gm. It was small and shrunken. Microscopically, it was markedly altered. There was a decided increase in the bile ducts, which were embedded in a great deal of connective tissue. In some places the bile duct proliferation suggested adenoma. The hepatic cells were considerably reduced in number, appearing as islands because of the constriction of the surrounding connective tissue. After the microscopic report on the sections, it was possible to establish a diagnosis of biliary cirrhosis.

This is not a case of congenital biliary cirrhosis, since symptoms were not manifest until the child reached the age of 10 or 11 months.

While in adults alcohol plays a leading part, in infants dyspepsia frequently plays the leading rôle. In this case syphilis can be excluded, as both mother and infant gave a negative Wassermann reaction. Malaria can be excluded. As causative factors of this condition, it is believed that the absorption of toxins abnormally produced in the intestinal tract, enteric troubles from birth, or grossly improper diets, all may be responsible. In this instance, no assignable etiology could be found.

Interest attaches to this condition at any age during childhood, and particularly so with very young patients. Since the patient described here was less than 11 months old at the time of death, she is one of the youngest persons with biliary cirrhosis of the liver who has been reported.

DERMATITIS EXFOLIATIVA. DR. STANEY CRAWFORD.

R. S., a girl, aged 10 years, of American parentage and with an unimportant family history, developed at the age of 6 months a moist, red, scaling condition behind both ears which gradually spread over the face, scalp and neck and after eighteen months involved the entire surface of the skin. The process continued, with periods of some exacerbation or remission, throughout childhood. At the age of 4, the elbows, wrists, fingers and knees became fixed in flexion and remained flexed until she was 8 years of age, when they were straightened by orthopedic measures during her six months' stay in the Children's Hospital. At this time roentgenograms of the bones and joints did not reveal any pathologic changes. At the age of 4, she had pneumonia of the base of the left lung. When she was admitted to the Children's Hospital in March, 1927, at the age of 8, she had a marked generalized exfoliating erythroderma. The scalp was almost devoid of hair and was covered with greasy, adherent scales which tended to pile up into masses. The face was red and scaly and appeared slightly puffy; the skin was taut, especially about the eyelids which could not be completely closed and were slightly averted, exposing congested conjunctivae. The trunk was a dusky red and showed exfoliated, rather large polygonal scales which presented a free edge that struck out from the skin prominently, much as do the scales in Wilson's dermatitis exfoliativa of the adult. Occasionally, there was moderate itching.

The chest was barrel-shaped, the left side being smaller than the right. The abdomen was protuberant. The arms and legs were small with poor muscular development, and the skin over the permanently flexed elbows, wrists and knees was dusky red, smooth and shining and suggestive of a finely atrophic process. The fingers were swollen and sausage shaped and were held in rigid semiflexion. The feet were slightly swollen on their dorsal surfaces. The skin of the arms and legs, including that of the hands and feet, showed marked redness and exfoliation. At this time, the child resented being handled. The eyebrows and eyelashes were sparse, and in the eyebrow areas the greasy scales piled up into adherent masses. The lips were moderately cyanotic. The teeth and tonsils were normal. The roentgenogram of the chest showed an opaque area over the entire left lung, suggesting a collapsed lung with fluid or pus at the base and a small area of pneumothorax above. No mediastinal glandular enlargements were noted. Repeated thoracentesis failed to produce any evidence of fluid or pus. Breathing was labored and of a wheezing, rattling, bronchial type. The base of the left side of the chest was flat to percussion, though a coin tinkle sound was elicited. The heart was not enlarged, though the roentgenogram showed it displaced to the left; the sounds were rapid, regular and of fair quality and the apex beat could be neither seen nor felt. The liver and spleen were not palpable, and the protuberant abdomen was normal surgically. The finger tips were enlarged and the nails dystrophic from thickening, opaqueness and upward curving. In the posterior cervical region, small, firm glands the shape of marbles were palpable.

The temperature ranged from 99 to 101 F., with an occasional extension to 102 or 103 F. The pulse rate ranged from 110 to 130 a minute, with periods in which it was as low as 90 and as high as 140. Respirations averaged 25 to 30 a minute. The Wassermann reaction of the blood was negative, as was the intracutaneous tuberculin reaction in 1:1,000 to 1:500 dilutions. Examinations of the sputum for tubercle bacilli gave negative results. The red blood cells averaged 3,000,000, the white cells, 11,000, and hemoglobin, 60 per cent. Polymorphonuclears were 68 per cent; small lymphocytes, 25 per cent; large lymphocytes, 4 per cent; eosinophils, 2 per cent and basophils, 1 per cent. The urine was normal, except for an occasional trace of albumin. In the feces, the following organisms were identified: *B. coli communis, B. acidi lactici, Staphylococcus aureus, Staphylococcus albus, Streptococcus fecalis* and enterococci.

During the past year, the redness and scaliness have subsided somewhat from the trunk and limbs but have continued over the scalp, face and neck; the backs of the hands are still red but show greatly diminished scaling. The trunk and

extremities have almost cleared. The entire left side of the chest is still opaque on roentgen examination. The red blood cells number 3,000,000, and the white cells, 11,000, the differential count being practically the same as it was one or two years ago. The skin reaction to tuberculin (intracutaneously 1 : 500) is still negative. The glands in the postcervical area are still firm and like small round marbles. The child is undersize for her age, though her mental acuity is somewhat above the average for this age, especially as she has never attended school.

A case of dermatitis exfoliativa is herewith presented which developed in a breast-fed infant at the age of 6 months and continued without cessation to the age of 10 years.

The cause of the erythroderma is still unsolved. Whether it is due to the absorption of toxic material from an abscess of the lung, an erythroderma prior to the onset of Hodgkin's malignant lymphogranulomatosis, of lymphoplastic lymphadenosis or of leukemia, or a type of toxituberculid as represented by some cases in adults as pityriasis rubra of Hebra, further study and observation may disclose.

TALIPOMANUS. DR. T. O. ELTERICH.

The title of this case is talipomanus, or congenital club-hands. However, such a title only slightly describes the unfortunate situation of this boy. He is a stepchild of nature. Besides the malformations of his arms, he is stunted in growth and his general physical development is far from normal. He is 7½ years old, is 39 inches (98 cm.) tall and weighs a mere 28 pounds (12.7 Kg.). To emphasize the poor physical development, I shall compare him with his younger brother who is five years his junior and weighs more than he does. These are the only two children in the family, and there are no children dead. The mother and father are not only living and well but are of a robust constitution. However, on the mother's side, there is a male cousin, now an adult, who was born with one arm entirely missing. in the socket where that arm should be, there are the rudiments of a thumb. The other hand lacks a thumb. This reveals that the condition is not only a developmental anomaly but is also hereditary in its character. This concurs with the observation of Dr. Martmer of Detroit, who in 1927 (AM. J. DIS. CHILD. **34**:384 [Sept.] 1927) reported three cases of this kind in one family, a mother and her two male offsprings having similar conditions.

After a first glance at this child, a great many people have suggested that the slant of the eyes is mongolian in character. However, one has only to talk to him a few moments to realize that he is "on the job." Dr. Teagarden, psychologist at the University of Pittsburgh, subjected this boy to a psychometric test and noted that his mental age was 7 years and 2 months, contrasted with a chronologic age of 7 years and 5 months. He was able to read, with some skill, a selection that is considered standard for an average 10 year old child. He has an affable disposition and is very fond of music, and his father tells that he gets along exceedingly well with his schoolmates.

A roentgenogram of the cervical spine showed that there were numerous congenital malformation around that region. The clavicles were normal. The first and second ribs were abnormal in shape and size, as was also the case with the fourth, fifth, sixth and seventh cervical vertebrae. This accounts for the position of the head.

As one looks at the general development of this child and notes the excessive growth of hair on his back and the lesions scattered over his face and body, one cannot help but read into the picture, endocrine dysfunction. This condition consists of more than mere congenital malformations which are hereditary in nature.

I should like to make a suggestion that besides these malformations already mentioned, there might also possibly be a congenital malformation of one of the links of the endocrine chain and resulting from that, an abnormality in glandular secretion.

DENTAL FACTS OF INTEREST TO THE PEDIATRICIAN. DR. H. E. FRIESSELL.

The prevention of dental disease and the early recognition of dental defects are important. Examination of the mouth is frequently omitted from "a complete examination."

The pediatrician has the best opportunity to discover defects of the mouth in young children and to recommend dental attention.

Malnutrition of the mother is frequently the cause of poorly formed deciduous teeth; malnutrition of the child results in defective permanent teeth.

Regularity in the shedding of baby teeth and eruption of permanent ones is important in preventing malocclusion of the teeth and deformities of the face and the nasal passages.

Preventive measures against tooth decay must begin with the child of preschool age.

CONGENITAL HYPOSPADIA IN A GIRL WITH ENDAMEBA INFESTATION OF THE BLADDER. DR. ELLSMER PIPER.

Normal urination was reported in a white infant, aged 2 months. When the child was 7 weeks old, the daily output of urine was less each day until complete retention resulted. The distended bladder filled the abdomen. No urethral orifice was found at the normal location. Repeated attempts at catheterization were unsuccessful. Suprapubic cystotomy was performed to relieve the symptoms. The internal urethral orifice opened into the vagina. A vestige of urethra with an internal urethral sphincter was found.

An indwelling catheter failed to drain after being in situ for twelve hours. *Entameba histolytica* was found in the pent-up urine. Urine continued to drain from the suprapubic opening. Plastic repair of the urethra was not attempted. Urine was not voided through the vagina until two months after the suprapubic drainage. There were no other congenital defects. Physical development was normal.

Cecil (*J. Urol.* **14**:441, 1925) reported forty-seven cases in his search of the literature.

ACUTE RHEUMATIC FEVER WITH UNUSUAL CONDITION OF THE BLOOD. DR. D. H. BOYD and DR. G. R. LACY.

C. R., a white girl, an American, aged 4 years, was admitted to the hospital on March 30, 1928, and discharged on May 8, 1928; she was readmitted on June 13, 1928, and died on June 23, 1928. The chief complaint was pain in the joints, recurring periodically with swelling and redness for two and one-half months. She had had chickenpox and scarlet fever, but no other illness. The scarlet fever occurred in October, 1927, with some enlargement of the cervical glands as a sequela. The infection apparently was mild. Three months later, she began to have pain in the right knee, with swelling and redness, then in the left shoulder; the pain involved various joints, at different times subsiding, then recurring. There had been some loss of appetite and some dyspnea at times for two weeks before admission.

On admission she had swelling and tenderness and slight redness of the left ankle, the left wrist and the left elbow; the temperature was 100 F., the pulse rate 120, and respirations, from 20 to 30. In a few days the swelling subsided, and the patient was much more comfortable. Two weeks later the right wrist and right elbow became swollen and painful; the temperature rose to 100 F., persisting for two weeks, the joint swelling subsiding before the fever. She was then comfortable, with no pain and no fever for ten days, and was allowed to return home under the care of the family physician. She remained at home for one month and had two mild attacks of swelling of the joints during that time. She was admitted again on June 13, 1928, with swelling, redness and pain in the left hip of three days' duration, a temperature ranging from 103 to 104 F., a pulse rate of 150, and respirations, 30. The next day she developed a marked dyspnea, and a respiration rate of from 80 to 100; these persisted, with elevation of both pulse rate and temperature, and death occurred on June 23, 1928.

On admission, the child appeared well nourished with considerable pallor; the swelling in the joints mentioned previously, a systolic heart murmur with slight enlargement and accentuation of the pulmonic second sound, small pale tonsils and a few small cervical glands were found on physical examination. The lungs were clear; the abdomen was normal, and there was no enlargement of the spleen or liver. Examination of the blood was as follows:

On March 30, 1928, the red cells numbered 2,800,000; hemoglobin was 56 per cent. The white cells numbered 8,100, 79 per cent of which were small lymphocytes; 11 per cent, large lymphocytes; 8 per cent, polymorphonuclear neutrophils; 0.1 per cent, myelocytes, and 1 per cent, unclassified.

On April 6, there were 91 per cent small mononuclears, 3 per cent large mononuclears and 6 per cent polymorphonuclear neutrophils.

On April 16, the red cells numbered 3,200,000; hemoglobin was 67 per cent; the white cells numbered 6,200, 59 per cent of which were small mononuclears; 25 per cent, large mononuclears; 5 per cent, transitionals; 8 per cent, polymorphonuclear neutrophils, and 3 per cent, myelocyte eosinophils.

On June 16, the red cells numbered 1,576,000; hemoglobin was 33 per cent. The white cells numbered 3,000, 74 per cent of which were small mononuclears; 14 per cent, large mononuclears, and 12 per cent, polymorphonuclear neutrophils.

On June 23, the white cells numbered 1,850.

An oxydase test confirmed the blood count of April 16 and proved the cells to be of lymphocytic origin. The red cells showed moderate anisocytosis and slight poikilocytosis suggestive of secondary anemia. Blood culture was negative. The urine occasionally showed albumin and casts, but generally was normal. At no time was there any demonstrable enlargement of the spleen. After the second admission, two blood transfusions were given.

Three days before death there was some generalized edema, some change in the respiratory sounds in the left lung and slight drowsiness; the day before death, a few small petechial hemorrhages occurred, with some hemorrhage from the mouth, nose and bowel immediately before death. Autopsy was requested but refused.

The low leukocyte count with the high percentage of lymphocytes and only from 6 to 8 per cent polymorphonuclear neutrophils in a child, aged 4 years, certainly was not to be expected in the presence of an acute infection. At first, the possibility of an acute lymphatic leukemia in the "aleukemic" stage was considered. But there were no other signs of leukemia, and over a period of three months there was no change in the type of differential count. An infectious mononucleosis was considered, though the lymphatic glands were never enlarged sufficiently to warrant that diagnosis, and the other blood manifestations showed a marked anemia which could not be explained in that way.

Blood counts made during the febrile period showed no apparent effort of the blood to develop a polymorphonuclear leukocytosis. The decreasing cell counts, both red and white, suggested an aplastic condition, and it was considered that the disease was probably an aplastic type of anemia which could not develop sufficient leukocytosis to combat the rheumatic infection present. (The polymorphonuclear percentage is quite low even for an aplastic anemia.) The low percentage of neutrophilic cells and the low number of red cells both point to a defective functioning of the bone marrow.

A definite explanation of the blood picture probably cannot be given in the absence of a postmortem examination.

This case is reported because it shows a leukopenia with a low percentage of polymorphonuclear cells in the presence of an acute infection, and because it demonstrates a well known fact that in the absence of regenerative power on the part of the blood-forming organs, an acute infection does not tend to recover.

The blood picture in this case is quite different from that usually seen in acute rheumatism. In the usual case one finds a moderate leukocytosis, an average of 14,000 or 15,000 cells per cubic millimeter, with the increase being largely in the polymorphonuclear cells. Bosc and Carrieu claim that there is also an increase in

the monocytes. In the acute cases, there is a decrease in the lymphocytes, whereas in the chronic cases, there is an increase in the percentage of lymphocytes. The anemia is usually quite marked, with a somewhat lowered hemoglobin index. The pallor of the patients is, however, out of proportion to the existing anemia. In this case there is a normal hemoglobin index with red blood cells which show comparatively little morphologic and staining irregularities. The most marked variation from the usual, however, is in the differential leukocyte count. From the patient's first entrance into the hospital until the time of death, there was an unusually low polymorphonuclear count of from 8 to 12 per cent, with a marked corresponding increase in the mononuclear types of cells. The greatest increase was in the percentage of small lymphocytes. The count as recorded did not differentiate between large lymphocytes and monocytes, though the majority of this group appeared to have been lymphocytes. In each count the cells recorded as large and small mononuclears amounted to from 90 to 95 per cent of the total number present.

A few myelocytes, myeloblasts and lymphoblasts were noted in each preparation.

The differential count was made from blood films stained with MacNeal's stain and confirmed by the oxydase stain.

SEVERE ANEMIA IN AN INFANT DUE TO MALARIAL INFECTION OF UNUSUAL ORIGIN. DR. E. W. WILLETTS.

In an infant born in the Allegheny General Hospital on May 16, 1928, the condition at birth was not good, and whole blood was given subcutaneously. The child was breast fed with supplementary feedings after the second week. The parents were Greeks; both were in good health.

The child was readmitted to the hospital on July 12, because of constipation and fever, and pallor which the mother observed. On admission, the temperature was 102 F., the pulse rate, 160, and respirations, 24.

On physical examination, the infant appeared anemic, with a brownish yellow pallor of the face and body. The conjunctiva and mucous membrane of the oral cavity were pale. There was no bleeding from the gums. No petechiae were present. There was no evidence of rickets. The lungs and heart were normal. The liver was palpable at the costal margin. The spleen was great enlarged. The temperature subsided, and the peak of rise never exceeded 100 F., until July 17, when a daily rise to 105 with a daily fall, usually to 96, began.

On July 22, examination of the blood showed: red blood cells, 1,700,000; white blood cells, 8,000; hemoglobin, 35 per cent; color index, 1+; polymorphonuclears, 38 per cent; lymphocytes, 52 per cent; monocytes, 10 per cent. The red cells showed marked anisocytosis, poikilocytosis, polychromasia and normoblasts.

The urine showed a trace of albumin and a few hyaline and granular casts, but no pus or blood. Blood culture was negative. The Wassermann and Kahn tests were repeatedly negative.

On account of the severe anemia I was asked to see the patient, and on examining the blood films found *Plasmodium malariae*. Parasites were found in nearly every field and in all stages.

The administration of quinine was started on July 24, and the temperature soon became normal.

On August 13, the red blood cells numbered 3,400,000; hemoglobin was 65 per cent. On September 10, the blood cells numbered 3,360,000, and the white blood cells, 17,000. On this date, a transfusion of 135 cc. of whole blood was given.

On October 3, the red blood cells numbered 4,400,000; the white blood cells, 12,000, and hemoglobin, 75 per cent.

At no time were chills observed.

The origin of the malaria is unknown, and the only explanation is that the father must have been a carrier and inoculation must have occurred when an injection of his blood was made immediately after the child was born.

It has not been possible to find plasmodia in blood films from the father, and efforts to get him to donate larger quantity of blood for examination by the enrichment method have failed.

Malaria originating in Allegheny County is unknown in my experience. Anopheles has never been found here.

RARE ATROPHIC CONDITION OF THE SKIN. DR. W. H. GUY.

The case presented here is an example of an idiopathic macular atrophy. In a child, aged 12 years, the condition was of nine years' duration. As he had had repeated attacks of tonsillitis, tonsillectomy was advised and performed. Within a short time, a mastoid operation was performed. Six months after this, there began to appear on the upper part of the chest, neck and arms small papules the size of split peas, which persisted for from twenty-four to twenty-eight hours and then flattened out, leaving scars, which could be seen at the time of presentation. Lesions had appeared at intervals up to the time of presentation.

When the boy was 10 years old, the tonsils were removed a second time. After this operation he was put on a rather rich diet, which improved his general health and apparently at least temporarily stayed the condition of the skin. The position of the macular atrophies is one of classification only, as we are rather helpless therapeutically and practically nothing is known etiologically. Macular atrophies are rare. The case is presented as a an example of a rare atrophic skin disease with the idea in mind that the pediatrician may from time to time see such cases and perhaps throw light on an obscure subject.

PERICARDITIS. DR. H. C. FLOOD.

The most frequent cause of pericarditis in children above the age of 3 years is acute or subacute rheumatic fever. Fibrinous or serofibrinous pericarditis may be the only manifestation of rheumatic infection, or it may precede the development of symptoms referable to the joints. It is almost invariably associated with endocarditis. The exudate may be fibrinous, giving rise to the so-called dry pericarditis, or serofibrinous, with the accumulation of fluid within the pericardial sac. The amount of exudate is usually larger than in other types of pericarditis.

CASE 1.—Agnes S., a white girl, aged 8 years, of American parentage, developed acute tonsillitis three weeks before admission to the Children's Hospital. During the second week of her illness, she developed what was considered to be left lobar pneumonia. On admission and examination, crackling râles were heard in both bases, with no evidence of consolidation. The apex beat was seen and felt in the sixth interspace within the nipple line. The left border of cardiac dulness extended to the midaxillary line, the right border one fingerbreadth beyond the sternum. A cardiac friction rub was heard over the entire precordial area. A murmur of endocardial origin could be made out at the mitral area. She left the hospital seventy-nine days later, with definite evidence of mitral disease and cardiac hypertrophy.

CASE 2.—Thelma C., a white girl, aged 6 years, of American parentage, three weeks before entrance to the Children's Hospital developed an attack of tonsillitis, followed by acute rheumatic fever. During the course of the rheumatic fever, endocarditis developed. A few days before admission, the left side of the chest became dull on percussion with bronchial breathing at the left base. The signs were interpreted as those of serous pleurisy or empyema. Paracentesis in the midaxillary line in the fifth interspace disclosed the presence of fluid, about 5 cc. of serosanguineous fluid being withdrawn. When she was admitted to the hospital, evidence of marked cardiac embarrassment was present, with dulness over the entire left side of the chest and bronchial breathing over the left lower lobe posteriorly. A thrill and systolic murmur were present, with the apex beat at the sixth interspace just outside the nipple line. The area of cardiac dulness was increased both to the right and to the left, the left border extending to the midaxillary line. The patient was discharged forty-nine days after the onset of the illness, with no evidence of murmur or friction rub.

CASE 3.—C. D., a white boy, aged 10 years, of Italian parentage, had had repeated attacks of tonsillitis. Ten days before admission to the Children's Hospital, he complained of sudden agonizing pain referable to the cardiac region. A few days later, pain developed in the left knee. His condition became steadily aggravated, the cardiac pain being controlled only by morphine. On examination, the apex beat was noted in the fourth interspace, just inside the nipple line. The area of cardiac dulness was increased both to the left and to the right, the left border being at the midaxillary line. Bronchial breathing was noted at the angle of the left scapula. The pericardial sac was trapped, and 30 cc. of serosanguineous fluid was withdrawn, with marked benefit to the patient's condition. He was discharged from the hospital thirty-nine days after the onset of the illness, with no evidence of cardiac disease.

CASE 4.—Harry N., a white boy, aged 11 years, of Jewish parentage, had had frequent attacks of tonsillitis. He was sent to the Children's Hospital because of severe pain in the cardiac area, fever and shortness of breath of ten days' duration. Three weeks before admission, he had contracted tonsillitis. He had never had any pains in the joints. Physical examination revealed increased cardiac dulness, both to the right and to the left, the left border of dulness being in the midaxillary line. The apex beat could not be seen or felt. Bronchial breathing was noted at the angle of the scapula. The day following admission, cardiac embarrassment came on. The pericardial sac was tapped, and 25 cc. of serosanguineous fluid was withdrawn. The following day, a definite friction rub was made out. The child was discharged thirty-three days after the onset of his illness, with no evidence of cardiac disease.

The following case report is of interest. Though the case was originally included among those showing rheumatic heart disease, autopsy left the classification doubtful.

CASE 5.—Lulu F., a girl, aged 15 years, of negro parentage, contracted rheumatic fever one year before admission to the hospital and shortness of breath of several months' duration. She presented evidence of chronic valvular disease with mitral regurgitation and cardiac hypertrophy. Seventeen days after admission, a double murmur appeared at the apex coincident with a sudden rise in temperature. One week later, roentgen examination showed infiltration of both lungs suggestive of tuberculous invasion. Repeated examination of the sputum failed to show bacilli. One week later, the child coughed up about 20 cc. of bright red blood. At this time, the area of cardiac dulness extended to the midaxillary line. No friction rub could be made out. Two weeks later, evidence of fluid in the pericardium developed. The sac was withdrawn. Fourteen days later, another tap was unsuccessful. Three weeks later, death occurred. Autopsy revealed a generalized tuberculosis with tubercles studding the pericardium.

CASE 6.—Alex V., a white boy, aged 13 years, was admitted to the hospital because of severe pain in the chest accompanied by nausea and vomiting and marked dyspnea. The child had had shifting pains in the joints for the past five years. He was in the Children's Hospital during February, 1928, with rheumatic pericarditis. The heart was markedly enlarged to the left, with diffuse pulsation in the sixth left interspace between the nipple and the midaxillary line. A thrill was palpated over the mitral area. A double mitral murmur was present. At the base, there was a marked to and fro friction rub. Bronchial breathing was noted just below the angle of the scapula on the left side, with a few coarse râles at the base of both lungs. At the present time, the boy is in the hospital greatly improved.

Purulent pericarditis in children may develop at any age during the course of any of the septic infections of the blood stream. The exudate is usually purulent and the condition, as a rule, terminates in death.

CASE 7.—Robert R., a white boy, aged 3½ years, an American, was admitted to the Children's Hospital complaining of pain in the left thigh of five days' duration, accompanied with fever. He was referred to the hospital with a diagnosis of early osteomyelitis of the left femur. At this time, except for the swollen and painful thigh and inguinal adenitis, the physical examination gave negative

results. Four days after admission, an incision was made into the infected area, and a subperiosteal abscess was found. Culture of the pus evacuated revealed *Staphylococcus aureus.* Blood culture revealed *Staphylococcus aureus.* Three days later, a pericardial friction rub developed. Two days later the rub disappeared, and the area of cardiac dulness rapidly increased in size. The apex beat was noted in the fourth interspace, with bronchial breathing over the left base. Paracentesis of the sac was done, and 75 cc. of serofibrinous fluid was withdrawn. Culture of this fluid revealed *Staphylococcus aureus.* Death occurred four days later, ten days after the onset of the illness.

Pneumococcic pericarditis is not an infrequent complication of pneumonia, pleurisy, simple or serous, and empyema. The age incidence of this type is usually under 3 years. When effusion occurs, it becomes purulent. Infection of the pericardial sac occurs here, either by way of the blood stream, when the pericarditis may be a primary infection, or by contiguity, infection passing from the pleura, lymph nodes or lymphatic vessels. Recovery rarely, if ever, occurs.

CASE 8.—Fred M., a white boy, aged 4 months, of American parentage, was brought to the hospital for relief of cough accompanied by fever and vomiting. At birth he seemed normal, except for the presence of a large amount of mucus in the throat, accompanied by an expiratory cough. He gained normally until about one month before admission to the hospital, when the cough became much worse and he began to lose weight. Two weeks before admission he had lost weight rapidly, and at times became quite cyanotic. He was unable to retain any of his feedings. Physical examination revealed a left apical pneumonia. The day following admission, generalized edema developed. The area of cardiac dulness extended from 1 inch (2.5 cm.) beyond the right border of the sternum to the midaxillary line on the left. The heart sounds were of poor quality and distant, with the apex beat in the fourth interspace. The pericardial sac was tapped, and 40 cc. of serous fluid was withdrawn. Death occurred the same day. Autopsy confirmed the clinical examination.

CASE 9.—Freda May S., a negro girl, aged 2 years, had been ill for two weeks with cough and fever. Two days before admission to the Children's Hospital, the mother noted some puffiness about the eyes. Later, this edema involved the entire body. On examination, she presented evidence of a right apical pneumonia, with dulness over the right base. The heart was not definitely enlarged, but the sounds were slow and indistinct. Three days after admission the edema became more marked, and a high degree of cardiac embarrassment developed. The area of cardiac dulness increased to both the right and the left, and bronchial breathing appeared at the angle of the left scapula. The pericardial sac was tapped, and 50 cc. of serosanguineous fluid was withdrawn. Culture of the fluid gave no growth. Death occurred the same day, ninteen days after the onset of the illness.

CASE 10.—Clarence W., a white boy, aged 2 years, of American parentage, was admitted to the hospital suffering from lobar pneumonia. One month before admission to the Children's Hospital he contracted lobar pneumonia, the left lung being involved first. Later, the right lung became infected. He improved slightly during the month following admission, although the evidence of consolidation in the left lung persisted. One month later, the child developed the clinical evidence of pericardial effusion. Paracentesis of the pericardial sac was done, and 40 cc. of thick yellow pus was obtained. Death occurred two days later. Culture of the purulent fluid revealed a type I pneumococcus.

TYPES OF DIABETES. DR. Z. R. SCOTT.

CASE 1.—T. R., a white boy, aged 7 years, was admitted to the Children's Hospital on July 1, 1928, with a history of having had glycosuria for two years. During this interval, he had been in diabetic coma on two occasions. The greater part of this period, he was under dietary and insulin treatment. The interesting feature about this patient is that in addition to the ordinary symptoms and the manifestations of diabetes mellitus shown in the urine and blood he presented some

features of a pituitary disturbance. He was obese; the facies suggested some pituitary disturbance, and he was generally underdeveloped. The right testicle was undescended.

CASE 2.—A. G., a white boy, aged 16 years, was admitted to the Children's Hospital on Jan. 9, 1928, having suffered from headaches and vomiting for the past three years. He also complained of some edema of the ankles during the past year.

On admission, he was obese and of short stature. The pelvis was narrow and of the female type. There was infantile development of the penis and scrotum.

The urine was markedly positive for albumin, and he had a constant glycosuria, varying from a slight trace to markedly positive. The urine also showed hyaline casts and red blood cells.

Chemical examination of the blood revealed: nonprotein nitrogen, 36; sodium chloride, 615; creatinine, 1.7; urea, 15; sugar, 64.5. The sugar tolerance tests were normal. Roentgen examination showed that the sella turcica was normal. This patient is of interest because:

1. He presents definite symptoms of disturbance of the anterior lobe of the pituitary glands as manifested by obesity, genital infantilism and a long narrow pelvis.

2. In spite of the persistent glycosuria, he has always had a normal blood sugar, and the sugar tolerance tests were normal.

CONGENITAL INTESTINAL OBSTRUCTION OF THE JEJUNUM. DR. J. H. WAGNER.

This case occurred in an infant, aged 10 days, who had regurgitated his food, both before and after his feedings, from the time of birth. The regurgitations were of small amounts and did not comprise the whole of the feeding. These were definitely bile stained on numerous occasions. The bowel movements had shown normal meconium, and later the feces were definitely bile stained. The child continued to lose from 10 to 20 Gm. in weight daily and was seen two days before entrance at the Magee Hospital by Dr. Z. R. Scott.

At that time, Dr. Scott thought he could feel a mass in the right lower quadrant of the abdomen. He made a diagnosis of intestinal obstruction and sent the child to the Children's Hospital.

I saw the child within an hour. The abdominal examination gave negative results. No mass was palpable; the child looked slightly toxic but did not vomit during my observation. After the child was observed for an hour, and after a family history of food disturbances of other children in the family was elicited during the interval, he was given an ounce of 30 cc. of a half milk and half water formula and was watched for an hour. There was no regurgitating or vomiting. Three feedings were given during the night, with regurgitations of small amounts only once or twice. When the child was fed, a definite peristaltic wave could be seen about the umbilicus.

Twenty-four hours after admission, the infant again began to vomit persistently. Abdominal examination did not show any definite evidence of tumor, but the upper part of the abdomen was definite distended.

Operation was carried out by a right rectus incision; the stomach and duodenum were markedly dilated as the result of an adhesive band connecting the meso-appendix to the posterior wall of the abdomen which extended over the first part of the jejunum and caused a constriction. This was rather hard to locate because of the small intestine lying over the top of the constricted area. After this band, which was about the thickness of a no. 60 thread, was incised, the intestinal contents moved forward normally. The abdomen was closed in the usual manner, and the recovery was uneventful.

This case is interesting because (1) of the type of obstruction, which was at first incomplete, becoming complete when the stomach became distended with fluid, causing a valvelike formation above and complete obstruction, and (2) the inability to make an early diagnosis because of the presence of bile in both the vomitus and the stool.

CONGENITAL ANOMALY OF THE INTESTINAL TRACT. DR. E. R. MCCLUSKEY.

A case of congenital atresia of the small bowel was presented. A new-born child was jaundiced and constipated and vomited all food taken. Barium did not pass far beyond the stomach. At autopsy, the stomach was normal. The duodenum and the first part of the jejunum were markedly dilated. Following this was a cordlike structure which had deficient mesenteric attachment. The large bowel was essentially normal in structure.

1. Fetal peritonitis was ruled out by examination and microscopic section of the lymph glands.

2. Arteriosclerosis was ruled out by examination of the vessels and constricting bands by examination.

3. Development of the small bowel was not arrested, as normal layers were present in the cordlike structure.

4. This case is thought to be due to constriction at the time of rotation of the small bowel to the right as both bowel and mesentery are affected where the loop crosses; other possible causes have been ruled out. This is much the rarest cause of malformation.

HEART BLOCK AND COMPLICATIONS. DR. J. D. IAMS.

A boy, aged 10 years, was admitted to the Mercy Hospital on Feb. 12, 1928. His family and past histories were unimportant. Early in January, he contracted diphtheria. He was given antitoxin, remained in bed two weeks and apparently recovered. Three days before admission to the hospital, his parents noticed edema of the face and ankles, and it was for this reason that he was brought to the hospital.

Physical examination gave the following results: temperature, 100 F.; there was edema of the face, particularly under the eyes; otherwise examination of the head showed nothing noteworthy. There was edema over the back of the chest. Fine moist râles were heard in the bases of both lungs. The heart showed marked erythema and an enlarged apex beat in the sixth interspace, 1 cm. to the right of the nipple line. No murmurs were heard. The liver was 5 cm. below the costal margin. The spleen was not felt. There was no fluid in the abdomen. The angles did not show any edema. Roentgen examination of the chest showed enlargement of the heart to both the right and the left of the median line. The left auricle and the left ventricle were chiefly involved. The blood count showed 26,500 leukocytes; otherwise, it was not noteworthy.

The electrocardiogram was interesting and unusual.

The diagnoses were cardiac decompensation, heart block, pulmonary congestion and nephritis. While in the hospital, the patient developed paralysis of the soft palate.

Electrocardiographic Tracings.—On Feb. 15, 1928, about three days after the onset of failure, the patient not having received any medication, the tracing showed: auricular flutter with 1, 2 and 3 to 1 heart block; right preponderance with notching of S in lead 1; ectopic focus-P waves in leads 1 and 2 directed downward.

On February 20, after the administration of about 6 drachms (22.5 cc.) of tincture of digitalis, the tracing showed: impure flutter with periods of complete dissociation or auricular escape; preponderance normal; no notching of R in lead 1. Periods of asystole probably due to vagal or sinus inhibition.

On February 23, the administration of digitalis was continued but there were no signs of intoxication. The tracing showed: flutter again but impure because the auricular and ventricular deflections were occasionally superimposed; preponderance normal, P upright in leads 2 and 3; no periods of slowing but suggestive of this occasionally.

On March 12, there was a pure flutter, which resembled that in the first tracing except that all P waves in leads 2 and 3 were downward, indicating an ectopic focus again. The block was the same.

On April 26, the tracing showed a practically normal mechanism but two instances of auricular escape. The child was free from symptoms.

On August 28, the last tracing was taken. It showed a slow rate with marked vagal slowing and several instances of auricular escape. The child was free from symptoms and quite active. The waves suggesting fibrillation in lead 2 were probably due to string.

Barium chloride, quinidine atropine and strychnine in physiologic doses used at different times produced no significant variations in the foregoing changes. It is noteworthy that in none of the tracings were there any significant changes in the T waves, such as inversion in leads 1 and 2, which have been pointed out frequently in postdiphtheritic heart disease.

Evidence points to the neurogenic rather than the myogenic origin of failure and that the cause of decompensation was due not to a myocardial change, but to some derangement of the nervous mechanism of the heart.

CHICAGO PEDIATRIC SOCIETY

Regular Meeting, Dec. 18, 1928

M. L. BLATT, M.D., *President, in the Chair*

ENURESIS IN CHILDREN: OBSERVATIONS ON CAUSATION AND TREATMENT (INAUGURAL THESIS). DR. GEORGE MOHR and ELINOR H. WATERHOUSE.

This thesis appears in full in this issue.

CERVICOVAGINITIS. DR. IRVING F. STEIN, DR. M. L. LEVENTHAL and DR. HARRY SERED.

This study of 296 consecutive cases of cervicovaginitis appears in full in this issue.

DISCUSSION

DR. JOSEPH BRENNEMAN: Dr. Leventhal said it was recognized that both the gonorrheal and the nongonorrheal forms of cervicovaginitis are transmissible. That is so foreign to my ideas that I should like to know what evidence he has. There is also the fact that these conditions recur after from three to six months, and in some instances after longer periods, two or three years, following three negative smears. I should like to know also how the treatments are administered and by whom.

DR. H. E. IRISH: I should like to know whether the essayists have any histories of untreated patients with vulvovaginitis. My impression after going through the period of active treatment has been that the untreated patients have progressed about as well as the treated ones. I do not know of any series of experiments that has been conducted with the idea of determining the average number of untreated patients.

DR. H. SERED: Our experience has been that in acute cases the patients respond best to treatment, and those that are seen late require the longest time. In the chronic type it has sometimes been necessary to add a drop or two of potassium iodide by mouth, which helped to clear the condition.

DR. IRVING F. STEIN: The reason we undertook this investigation and tried to work out a suitable treatment was that the cases of vaginitis were not satisfactorily dealt with. Some of the patients were sent to the pediatric section, some to the gynecologic and some to the urologic department. We tried treatment with ointment, suggested by Dr. Gellhorn, using 1 per cent mercurochrome-220

soluble, with great satisfaction. We have not found it necessary to change from this treatment. We sometimes make topical applications of 5 or 10 per cent silver nitrate, through the vaginoscope to touch up a macule on the cervix, and then follow with the mercurochrome ointment.

I think that handling the children is simply a matter of personality. In cases of unruly children we give an incomplete treatment the first time; sometimes we ask the nurse to rub a little of the ointment on the vulva and tell the child that that is the treatment. The next time we use the rubber tip, as the child finds it does not hurt, she becomes cooperative. The vaginoscope can then be introduced without trouble, if it is done slowly and carefully. The only time we have difficulty with unruly children is when the mother insists on being in the room. We usually have a nurse who is accustomed to giving the treatment daily in the clinic. In private cases, the mother is usually entrusted with the treatment. When the mother sees how easy it is to give the treatment, and the child knows that her mother can do it, there is no trouble. We have never needed to give gas or a local anesthetic.

In reply to Dr. Brenneman concerning the transmissibility of the two types, the gonorrheal type is much more severe and more readily transferred than the nongonorrheal.

Dr. Irish brought up the question of what would happen to a child if allowed to go untreated. The same question is brought up in connection with gonorrhea in adults, but would one be willing to leave such a case alone if it occurred in one's own family? If the child should develop serious complications, one would feel that he might be responsible. It might be construed as neglect.

We have not used the complement-fixation test.

One point is that we often see children who have been treated elsewhere, and the mother states that mercurochrome ointment was used with unsuccessful results. In many instances we have found that the ointment was smeared on the vulva and never reached the vagina. We feel that this incorrect use of treatment leads to unjust criticism of the method.

Finally, we wish to stress the ease of the examination with the vaginoscope. It does not require any longer to slip it in place than to make a smear. It requires a little more equipment and effort, but we are rewarded by what we learn in consequence of its use.

Discussion of the Thymic Question with Case Reports. Smooth Muscle Spasm and Thymic Symptoms. Dr. C. A. Aldrich.

This report of forty consecutive cases bearing on the thymic question is made in an attempt to explain the clinical facts seen by known physiologic processes. The symptoms tabulated are as follows: stridor 10, cyanosis 16, dyspnea 3, attacks of choking 17, asthma 6, pylorospasm 18, pallor 4, apnea 1, laryngospasm 2, rectal spasm 1, spasmodic cough 2, retraction of the neck 1, irregular breathing 1 and cardiac murmur 3. Thirty of the forty showed large substernal shadows and three, questionable ones; three showed no evidence of thymic enlargement as revealed by roentgen examination and four were not examined roentgenologically. Thirty-four of the thirty-five patients treated by irradiation responded promptly in that the symptoms disappeared at the time of treatment. One child died in a cyanotic attack eighteen hours after the first exposure. Three treated patients responded promptly though there was no evidence of thymic enlargement. Roentgen treatment was given in only one of the five cases in which death was reported. In four instances autopsies showed status lymphaticus as the only demonstrable cause for death.

In the discussion it is noted that most of the symptoms can be explained as smooth muscle spasm under vagus control, a few as spasm of other muscles under autonomic control, and one or two as pressure of the gland itself. Vagotonic symptoms and enlargement of the thymus are linked together under the following hypothesis: In the new-born infant, the suprarenal glands have been shown to undergo involution during the first few weeks. It is possible that this results in

a decreased production of epinephrine. If this reaches a sufficiently low ebb, vagotonic symptoms might be produced due to the lack of stimulation of the sympathetic, the physiologic antagonist of the vagus nerve, by epinephrine. Coincidentally with this, since in the experimental animal adrenalectomy is followed by thymic hypertrophy, one might expect to find enlargement of the thymus gland clinically. Just why favorable results follow irradiation of the thymus gland is not discussed here, but one or two possible explanations may be offered.

DISCUSSION

DR. WILLIAM B. MCCLURE: I wish to cite the interesting case of a boy, weighing 6 pounds, 2½ ounces (2798.4 Gm.), who was born on July 29. Delivery was normal, but breathing was slow in starting. The infant became blue and then pale before respiration was established. When I first saw the child, one hour after birth, his color was good. Breathing and heart sounds were normal. There had been considerable molding of the head. The infant seemed normal during the first three days. For the next three weeks, during my absence, the infant was under the care of Dr. Robert Blessing. On the fourth day after birth, the baby had cyanotic attacks, was languid, did not nurse well and vomited. Roentgen examination at this time did not show enlargement of the thymus gland. Regurgitation and vomiting occurred rather frequently during the next nine days. At the end of this time, Dr. Blessing described the infant as a thin, hypertonic baby with questionable visible gastric peristaltic waves. He weighed 5 pounds, 12 ounces (2608.16 Gm.).

On August 20 (nine days later), the weight was 6 pounds, 8½ ounces (2968.5 Gm.). Forcible regurgitation had been fairly constant. Peristaltic waves were seen after nursing and a forcible emesis occurred. A pyloric tumor, however, could not be felt. Dr. Blessing thought that the condition was probably pylorospasm or pyloric stenosis. Atropine was given without apparent benefit, then discontinued. A thick cereal given before each nursing caused improvement as to the vomiting.

I saw the baby again when he was 5 weeks of age. He was better, weighed 7 pounds, 5 ounces (3316.9 Gm.) and vomited about once daily. When he was about 8 weeks of age, the vomiting became more forcible. A dark-brown bloody vomitus was present on several occasions. The thick cereal was discontinued and atropine sulphate was given before nursings. The vomiting became less frequent.

On October 11, when 10½ weeks of age, the infant again vomited blood-stained material. On October 12 he weighed 9 pounds, 12 ounces (4422.5 Gm.), having gained 2 pounds, 7 ounces (1105.6 Gm.) in six weeks. On October 15, with atropine omitted, roentgen examination of the gastro-intestinal tract showed: the esophagus dilated to about three times the normal size; the food regurgitating from the stomach into the esophagus; no evidence of pyloric stenosis (at the end of five hours the stomach was practically empty); and, as had not been anticipated with the negative observation of the previous examination, a large thymus gland. Roentgen treatment was given on October 16, and the infant was placed on nursings at intervals of four hours. Atropine was not given again. On the following day the mother reported that the infant was much improved and seemed like a different child. He was taking from 4 to 5 ounces (113.4 to 141.7 Gm.) of milk at each nursing without vomiting. A second roentgen treatment was given on October 23. On November 28, the mother said that before the second roentgen treatment the infant had vomited after about one feeding a day with a little "spitting up" after other feedings, but that since the second roentgen treatment there had been no vomiting and only spitting up of a mouthful occasionally soon after feeding. She said that immediately after the second roentgen treatment he acted like a different child; he was sleeping better and was no longer fretful. A cough after feeding, however, had been present for several weeks. The weight on November 28 was 12 pounds, 14½ ounces (5827.1 Gm.).

On December 4 the mother reported that on the previous day the infant vomited about 1 ounce (28.3 Gm.) during the feeding at 6 a. m.; again, at 2 p. m. before feeding, a dark blood-stained material, and at 6 p. m., about 1 ounce (28.3 Gm.)

of milk without blood. He had an irritating cough with each feeding. A roentgen examination on this day showed the substernal shadow still somewhat large but smaller than at the former examination. There was apparently no delay in the barium passing to the stomach, but there was still a slight dilatation of the lower third of the esophagus which seemed less than at the previous examination. A third roentgen treatment was given on the same day. On December 10, the mother reported that the infant was happy and had not vomited but had spit up mucus several times when coughing.

DR. I. HARRISON TUMPEER: Dr. Aldrich is to be congratulated for arriving at a fundamental truth underlying what appears to be various unrelated phenomena. If one sufficiently appreciates his thesis, one will find that he has given here a probable explanation for so-called tetany. If one examines the list of smooth muscle spasms, one will find that he has described here the equivalent of the convulsions of tetany, laryngospasm, bronchotetany and gastrotetany. It is easy to imagine that cases of vesical spasm and other forms of tetany also occur on the same basis. The common denominator is a large thymus gland.

For many years I have observed that infants with so-called spasm consistently develop craniotabes at the age of 4 months, material which I hope to have the privilege of presenting to the society at a future date. Reasoning backward, I concluded that pylorospasm, so-called, was an early, if not the earliest, manifestation of the spasmophilic diathesis. As corroborative evidence, these same children develop into the hypertonic type with positive Chvostek sign, and frequently develop hay-fever, asthma, urticaria and evidences of exudative diathesis. As my observations proceed, it appears to me that we may yet find that the so-called spasmophilic diathesis and the so-called exudative diathesis are fundamentally the same. In further corroboration of Dr. Aldrich's results, I have records and roentgenograms of many of these infants with so-called pylorospasm with almost constant enlargement of the thymus gland and often dramatic cessation of the projectile vomiting following exposure to the roentgen rays.

I should like to mention another group of cases with conditions of the thymus gland related to changes in the bone rather than muscle spasm, which I hope to present in greater detail at a later date. There is a group of infants who manifest rickets, usually with marked funnel breast, definitely not on the basis of an avitaminosis. These infants have had breast milk, sunshine and cod liver oil to the same extent as those in a control group. Roentgenologic examination discloses a large thymus gland.

DR. JESSE R. GERSTLEY: It takes some courage to discuss a paper as complete and thorough as this one; however, one thought occurs to me. Cerebral hemorrhage is found in the new-born infant much more frequently than was formerly considered. Often such a hemorrhage runs on to spontaneous recovery. Nonfatal cerebral hemorrhage might have caused symptoms in the new-born infant similar to those described by the essayist.

Were lumbar punctures done in any of these cases, and in those terminating fatally did the autopsy include the nervous system?

DR. MAXWELL P. BOROVSKY: The principle of Czerny's thought is that the thymus gland is not capable of producing the symptoms of pressure that are seen, and all through Germany and Austria they are amused by our noting enlargements of the thymus gland. Meyer looked over a report from an American, who stated that he had seen forty cases within a short time, and said that so far as he knew there had not been forty cases in Berlin in ten years. They say that thymic enlargement is rare in their cases, and that the diagnosis made by the roentgenologist is based on the fact that the picture is taken at the height of expiration. They have shown definitely normal infants with pictures taken at the beginning of inspiration and at the height of expiration, showing a definite increase in the substernal shadow. Just why they do not see these cases and we see so many over here is a question. We all see children with paroxysms of breath-holding and choking that respond so dramatically to roentgenotherapy, and it is almost

unbelievable that these European physicians, who are the original superior clinicians, do not know of this condition.

DR. CLIFFORD G. GRULEE: Gerstenberger has shown that the thymus gland always appears large if the diaphragm is high and our pictures are taken with a low diaphragm.

There may be an explanation in the fact that there are a large number of cases of goiter here. I should not be surprised if something of a similar nature would be found for the enlargement of the thymus gland in this region that has been found in connection with the enlargement of the thyroid gland.

DR. ARTHUR H. PARMELEE: It might interest Dr. Aldrich to know that during the last three years I have examined about 8,000 infants during the first 8 days of life at the Cook County Hospital and have tried carefully to percuss the thymus gland. I did this because in the early part of the examinations I found enlargement of the thymus gland so infrequently in the new-born infant. I admit that percussion of the thymus gland is a matter of personal choice, but I have made a note only of those that showed an enlargement to the right of the midsternal line of at least 2 cm., and have been impressed with the almost negligible number that showed any enlargement during the early days of life. It is all out of proportion to what one would expect to find later in regard to the thymus gland. Unfortunately, the observations on these children have not been checked by roentgen examination, but I think that procedure would bear out this observation of the great paucity of enlargement of the thymus gland in the new-born infant.

DR. I. MICHAEL LEVIN: The presence of mucous plugs in the bronchi, causing obstruction with resultant cyanosis and dyspnea, may account for many attacks of asphyxia, as emphasized by the work of Chevalier Jackson.

The relationship between status lymphaticus and tetany has been suggested. Roentgen treatment with shielding of the neck with an incomplete lead plate or a low position of the thyroid gland with its attached parathyroid glands may expose the parathyroid glands to destructive changes with symptoms which are much akin to those seen in tetany following thyroidectomy. This suggests a possible explanation for the two instances of sudden death following roentgenotherapy. An interesting theory to explain the improvement in thymus cases after exposure to roentgen rays is that the remote effect of the rays is stimulation to the adjacent parathyroid glands. In this respect the study of the electrical reactions and chemical changes in the blood in these infants before and after exposure to x-rays would be valuable.

DR. WILLIAM G. ALEXANDER: The pediatricians are not alone in their interest in what the x-rays are doing for the thymus gland. At the meeting of the American Roentgen Ray Society in Kansas City this fall an entire evening was given to a discussion of the thymus gland. I think that the x-rays offer the most reasonable and accurate method of diagnosing an enlargement of the thymus gland, but I wish to emphasize two or three things: First, anteroposterior views of the chest will not always determine the size of the thymus gland, for it has been definitely shown that the thymus gland may be enlarged laterally in a pancake shape, as well as anteroposteriorly in the so-called sausage shape. I think that the latter is the more dangerous type when one considers the symptoms of pressure. The lateral views are extremely difficult to take with accuracy, for the infants are usually squirming, and it is almost impossible to keep them in proper position. There are so many heavy bones to go through that the results have not been satisfactory, but it would be ideal if we could work it out.

I wish to stress the point that one should be extremely careful in the first treatment of the patient with enlargement of the thymus gland. The policy in my department is to give probably not more than one-third or one-half the amount given at the later treatments. The thyroid gland is markedly stimulated by the x-rays. Why is the thymus not also? We have many hundred cases referred by the pediatricians, and we have had three or four that have caused much distress to the pediatrician and myself, as well as to the patient, within a few hours after treatment.

I do not know how many deaths have been reported following treatment, but I do not know of any deaths that have been reported following three treatments.

I think Dr. Aldrich has presented one of the most interesting papers I have heard in many years, and I believe the theory that he brings out has a great deal in it. The pressure theory does not satisfy us, I am sure. Treatment of the thymus gland by x-rays has been so satisfactory for the relief from symptoms that one can hardly turn it aside. I think Dr. Aldrich has laid the foundation for investigation that will prove helpful.

DR. C. A. ALDRICH: I should not be surprised if it will be developed later that in dealing with what has been called a thymic condition in infants we have to do with a condition similar to asthma, the exudative diathesis and anaphylactic pneumonia. No one mentioned the fact that the French and German literature is filled with references to vagatonia, while the English and American literature has little concerning it. Thymic enlargement has been studied and written about in connection with vagatonia for some time.

Dr. Gerstley brought up the question of cerebral hemorrhage. I may be all wrong, but I think cerebral hemorrhage was not present in any of my cases. We did not do any spinal punctures. My patients were not treated in the hospital. Most of the infants were more than 1 month old, and I think there is no possibility of their symptoms being due to cerebral hemorrhage at that late date. Fortunately, there were few necropsies, but these did not reveal any cerebral condition.

Dr. Grulee brought up the question of the thymus and the thyroid glands, and many articles have been written on the relation between goiter and the thymus gland. That is an interesting suggestion, and it may be true that this region has more thymic enlargement than other places, for we are in the goiter belt.

I agree with Dr. Parmelee regarding the difficulty of percussing the thymus gland, and it is interesting that so few enlargements were found in the new-born infant.

I have seen augmentation of symptoms after treatment, and in many of the cases reported there was vomiting at least following treatment. The child who died after thirty hours may possibly have been unfavorably affected by the exposure, but I doubt it as he was moribund from the start. I do not believe that any one can explain all of these cases on the existence of plugs of mucus in the bronchi, and such an explanation would not account for improvement when roentgenotherapy is used. I think that there was adequate shielding of the thyroid gland in all of my cases.

During the past summer I read over 1,200 case reports on treatment of the thymus gland. I think that I covered the literature thoroughly. There were few deaths reported following roentgenotherapy. A good many deaths were reported following radium therapy. Many writers mentioned the augmentation of symptoms following the first exposure.

In closing, I should like to insist that I do not consider that the thymus gland is ordinarily the cause of the symptoms seen.

Book Reviews

SOCIAL HYGIENE IM SÄUGLINGS-UND KLEINKINDESALTER. By EUGEN STRANSKY. Price, 8 marks. Pp. 125. Leipzig: Franz Deuticke, 1929.

The reviewer suggests that the pediatrician who shies clear of books on social hygiene need not be afraid to delve into the pages of this excellent monograph by Eugen Stransky, for he does not use the term social hygiene as a synonym for sex hygiene. His theme deals with the epidemiology, the social and medical causes, the morbidity, the mortality, the prophylaxis and the social and economic significance of diseases of children up to the school age.

The book is divided into three parts. In the first chapter the author discusses the diseases of the new-born infant. Here he considers prematurity, intracranial hemorrhages, congenital deformities, congenital syphilis, acute infections and still-birth. He sums up this chapter with his own opinion of the prevention of these diseases in the new-born infant.

The second and third chapters deal with the same subject matter in the nursling and in the child of preschool age.

Of special interest and of practical importance to the pediatrician are clearcut reviews of the present status of specific prevention of the contagious diseases. He brings to the attention of the reader the best opinions regarding the use of the Calmette method of inoculation against tuberculosis. The French favor general immunization and claim to have already reduced the mortality rate for tuberculosis from about 32 to about 8 per cent in a large group of infants under 1 year of age. The Germans, however, are still skeptical of these claims and have reported instances in which infants have been infected with active tuberculosis by the Calmette vaccine. In this matter the author takes the stand that it is still too early to use this method for universal administration. He comes to the same conclusion regarding the use of toxin-antitoxin against scarlet fever and vaccine for pertussis. Besides vaccination against smallpox and toxin-antitoxin for diphtheria, he believes that a careful analysis of the statistics of the data which he has collected does not justify the use of specific toxoids and vaccines for general immunization.

This monograph contains many important facts for the pediatrician. It is clearly written and brief, and the opinions of the author are logical and up to date.

DISEASES OF CHILDREN. Edited by HUGH THURSFIELD and DONALD PATERSON. Second edition. Price, $13. Pp. 1106, with 206 figures and 5 plates. New York: William Wood & Company, 1929.

This is the second edition of this book which was first published in 1913. The first edition was edited by Garrod, Batten and Thursfield. The general arrangement and phraseology of the first edition has been adhered to. The articles are written by thirty-seven different contributors, but the general style is the same. The subject is well covered, and the style is lucid and readable. The book is well printed, and the illustrations are well chosen.

THE MENINGOCOCCUS. By E. G. D. MURRAY. Report No. 124. London: Medical Research Council, 1929.

This extensive report gives the results of a close, sustained critical scrutiny of the general biology of the meningococcus, and of its reactions to its environment. The physiology in meningococcal infections, the virulence of the organism, the toxin and the immunity reactions are discussed in full detail. The author believes that contact with a person previously infected is the only source of infection. At least 95 per cent of all cases have not resulted from contact with patients having the disease, but from contact with "healthy carriers." A good bibliography has been appended.

DIABETES AND ITS TREATMENT. By FREDERICK M. ALLEN. Price, 30 cents. Pp. 98. New York: Funk & Wagnalls Company, 1928.

This is a rational presentation of the nature of diabetes and its treatment, written in terms that the layman of average education should be able to understand. The principles of dietary control and of the use of insulin are discussed in detail. The point of view is directed toward diabetes in the adult, only a paragraph being devoted to the peculiarities of the disease in childhood. Need for meeting the extra requirements of growth and activity is not mentioned. Sufficient emphasis is not given the danger of mineral and vitamin inadequacy in poorly chosen therapeutic diets.

Directory of Pediatric Societies

NATIONAL

AMERICAN MEDICAL ASSOCIATION, SCIENTIFIC ASSEMBLY, SECTION ON DISEASES OF CHILDREN

Chairman: Dr. W. A. Mulherin, 753 Broad St., Augusta, Ga.
Secretary: Dr. C. A. Aldrich, 545 Lincoln Ave., Winnetka, Ill.
Place: Portland, Ore. Time: July 8-12, 1929.

AMERICAN PEDIATRIC SOCIETY

President: Dr. Joseph Brennemann, 30 N. Michigan Blvd., Chicago.
Secretary-Treasurer: Dr. Howard Childs Carpenter, 1805 Spruce St., Philadelphia.
Place: Montreal, Canada. Time: May or June, 1930.

THE ASSOCIATION OF AMERICAN TEACHERS OF THE DISEASES OF CHILDREN

President: Dr. Paul W. Emerson, 86 Bay State Road, Boston.
Secretary: Dr. Ralph M. Tyson, 1527 Pine St., Philadelphia.
Place: Portland, Ore. Time: July 8-12, 1929.

AMERICAN CHILD HEALTH ASSOCIATION

President: Hon. Herbert Hoover, 370 7th Ave., New York.
Secretary: Dr. Philip Van Ingen, 370 7th Ave., New York.
Place: Minneapolis. Time: Sept. 30-Oct. 4, 1929.

CANADIAN SOCIETY FOR THE STUDY OF DISEASES OF CHILDREN

President: Dr. Thomas Crossan Clark, 51 Herkimer St., Hamilton, Ont.
Secretary-Treasurer: Dr. Frank H. Boone, 164 James St. S., Hamilton, Ont.

SECTIONAL

CENTRAL STATES PEDIATRIC SOCIETY

President: Dr. J. Gurney Taylor, 120 E. Wisconsin St., Milwaukee.
Secretary: Dr. A. H. Parmelee, 310 S. Michigan Ave., Chicago.
Place: Milwaukee. Time: October, 1929.

SECTION ON PEDIATRICS OF SOUTHERN MEDICAL ASSOCIATION

Chairman: Dr. J. H. Eugene Rosamond, 1074 Madison Ave., Memphis, Tenn.
Secretary: Dr. A. J. Waring, De Renne Apts., Savannah, Ga.
Place: Miami, Fla. Time: Nov. 20-22, 1929.

LOCAL

ALABAMA PEDIATRIC SOCIETY

President: Dr. J. MacBell, Mobile.
Secretary-Treasurer: Dr. Hughes Kennedy, Jr., Highland Plaza Apts., Birmingham.

NORTHERN CALIFORNIA PEDIATRIC SOCIETY

President: Dr. W. L. Channell, Medical Bldg., Oakland.
Secretary: Dr. J. E. Parrott, Medico-Dental Bldg., San Francisco.
Place: Various teaching schools. Time: Monthly.

SOUTHWESTERN PEDIATRIC SOCIETY

President: Dr. Ezra S. Fish, Pacific Mutual Bldg., Los Angeles.
Secretary: Dr. Fred L. Glascock, 1136 W. 6th St., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.

THE ROCKY MOUNTAIN PEDIATRIC SOCIETY

President: Dr. Elsie Seelye Pratt, Republic Bldg., Denver.
Secretary and Treasurer: Dr. Wilford W. Barber, Metropolitan Bldg., Denver.
Place: Children's Hospital, Denver. Time: Third Saturday of each month, 2:30 p. m., September to May, inclusive.

GEORGIA PEDIATRIC SOCIETY

President: Dr. W. N. Adkins, Medical Arts Bldg., Atlanta.
Secretary and Treasurer: Dr. E. N. Gleaton, 212 E. Gaston St., Savannah.

PEDIATRIC SECTION OF FULTON COUNTY MEDICAL SOCIETY, ATLANTA, GA.

Chairman: Dr. Lee Bivings, Exchange Bldg., Atlanta.
Secretary: Dr. William Kiser, Medical Arts Bldg., Atlanta.
Place: Academy of Medicine, 32 Howard St., Atlanta. Time: Second Thursday of each month from October to April, at 8 p. m.

NEW ENGLAND PEDIATRIC SOCIETY

President: Dr. Edwin T. Wyman, 483 Beacon St., Boston.
Secretary-Treasurer: Dr. Randolph K. Byers, 66 Commonwealth Ave., Boston.
Place: Boston Medical Library. Time: Second Friday of each month.

CHICAGO PEDIATRIC SOCIETY

President: Dr. Maurice Blatt, 185 N. Wabash Ave., Chicago.
Secretary: Dr. J. K. Calvin, 104 S. Michigan Ave., Chicago.
Place: City Club. Time: Third Tuesday of each month.

LOUISIANA STATE PEDIATRIC SOCIETY

President: Dr. J. A. Crawford, Lake Charles, La.
Secretary-Treasurer: Dr. C. T. Williams, 7401 Burthe St., New Orleans.

DETROIT PEDIATRIC SOCIETY

President: Dr. M. Boyd Kay, 10 Peterboro St., Detroit.
Secretary: Dr. Charles A. Wilson, 71 E. Ferry St., Detroit.
Place: Children's Hospital of Michigan. Time: No fixed date; approximately once a month.

NORTHWESTERN PEDIATRIC SOCIETY

President: Dr. C. R. Moriarity, La Salle Bldg., Minneapolis.
Secretary: Dr. E. S. Platou, 730 La Salle Bldg., Minneapolis.
Place: University Campus and Rochester, Minn. Time: Winter, Spring, Summer, Fall.

ST. LOUIS PEDIATRIC SOCIETY

President: Dr. Park J. White, Beaumont Bldg., St. Louis.
Secretary-Treasurer: Dr. Ralph L. Cook, 508 N. Grand Blvd., St. Louis.
Place: St. Louis Children's Hospital. Time: At least once a year and contingent thereafter on the arrangement of a suitable program.

NEBRASKA-IOWA PEDIATRIC SOCIETY

President: Dr. Floyd Clarke, City Nat'l Bank Bldg., Omaha.
Secretary: Dr. R. B. Eldredge, Medical Arts Bldg., Omaha.
Place: Add-Sell Restaurant. Time: Second Thursday of each month from October to May, inclusive, 6 p. m.

BROOKLYN PEDIATRIC SOCIETY

President: Dr. Louis M. Ruderman, 961 Eastern Parkway, Brooklyn.
Secretary: Dr. Joseph F. Paulonis, 1357 Bushwick Ave., Brooklyn.
Place: Kings County Medical Society Bldg. Time: Last Wednesday of each month, except June, July and August.

BRONX PEDIATRIC SOCIETY

President: Dr. L. H. Barenberg, 1749 Grand Concourse, New York.
Secretary: Dr. Joseph Golomb, 496 E. 175th St., New York.
Place: Concourse Plaza, 161st St. and Grand Concourse, New York. Time: Second Wednesday of each month, except June, July, August and September.

CENTRAL NEW YORK PEDIATRIC CLUB

President: Dr. Frank Vander Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Place: Various cities in New York. Time: Fourth Thursday of October, January and April.

NEW YORK ACADEMY OF MEDICINE, SECTION OF PEDIATRICS

President: Dr. Stafford McLean, 17 E. 71st St., New York.
Secretary: Dr. F. Elmer Johnson, 300 West End Ave., New York.
Place: New York Academy of Medicine, 2 E. 103d St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

ROCHESTER PEDIATRIC SOCIETY

President: Dr. John Aikman, 184 Alexander St., Rochester, N. Y.
Secretary: Dr. Howard F. Rowley, 278 Alexander St., Rochester, N. Y.
Place: Arranged by program committee. Time: First Friday of each month from October to May.

ACADEMY OF MEDICINE OF CLEVELAND, PEDIATRIC SECTION

Chairman: Dr. C. W. Wyckoff, 8314 Euclid Ave., Cleveland.
Secretary: Dr. C. L. Ruggles, 10616 Euclid Ave., Cleveland.
Place: 2009 Adelbert Road. Time: Four meetings, from September to May.

PHILADELPHIA PEDIATRIC SOCIETY

President: Dr. Ralph M. Tyson, 334 S. 21st St., Philadelphia.
Secretary: Dr. John D. Donnelly, 115 Bryn Mawr Ave., Bala-Cynwyd, Pa.
Place: College of Physicians, 19 S. 22d St., Philadelphia. Time: Second Tuesday of each month from October to June, inclusive.

PITTSBURGH PEDIATRIC SOCIETY

President: Dr. Zaccheus R. Scott, Westinghouse Bldg., Pittsburgh.
Secretary: Dr. Theodore C. Elterich, Highland Bldg., Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Friday, alternate months.

THE SOUTH CAROLINA PEDIATRIC SOCIETY

President: Dr. E. A. Hines, Seneca.
Secretary-Treasurer: Dr. R. M. Pollitzer, 105 E. North St., Greenville.
Place: Charleston. Time: May 8, 1929.

MEMPHIS PEDIATRIC SOCIETY

President: Dr. A. G. Quinn, 1193 Madison Ave., Memphis, Tenn.
Secretary: Dr. Kinsey M. Buck, 1024 Madison Ave., Memphis, Tenn.
Place: Memphis General Hospital. Time: Second Tuesday of each month.

TEXAS PEDIATRIC SOCIETY

President: Dr. Edwin G. Schwarz, Medical Arts Bldg., Fort Worth.
Secretary-Treasurer: Dr. Ramsey Moore, Medical Arts Bldg., Dallas.

RICHMOND PEDIATRIC SOCIETY

President: Dr. J. B. Stone, 2042 Park Ave., Medical Arts Bldg., Richmond, Va.
Secretary-Treasurer: Dr. Samuel A. Anderson, Jr., 2326 W. Grace St., Richmond, Va.
Place: Westmoreland Club, 601 E. Grace St., Richmond, Va. Time: First Thursday of each month (other than during the summer).

VIRGINIA PEDIATRIC SOCIETY

President: Dr. Charles E. Conrad, Harrisonburg.
Secretary: Dr. William B. McIlwaine, Petersburg.

NORTH PACIFIC PEDIATRIC SOCIETY

President: Dr. E. D. Carder, 736 Granville St., Vancouver, B. C.
Secretary and Treasurer: Dr. George A. Lamont, 736 Granville St., Vancouver, B. C.

SEATTLE PEDIATRIC SOCIETY

President: Dr. Arthur H. Gray, Lumber Exchange Bldg., Seattle.
Secretary: Dr. Armin Rembe, Stimson Bldg., Seattle.
Place: College Club. Time: Third Friday of each month, at 7 p. m.

MILWAUKEE PEDIATRIC SOCIETY

President: Dr. A. L. Kastner, 120 E. Wisconsin St., Milwaukee.
Secretary: Dr. F. R. Janney, 418 E. North Ave., Milwaukee.
Place: Children's Hospital, Milwaukee. Time: Second Wednesday of each alternate month, beginning with February.

ACADEMY OF MEDICINE, TORONTO, SECTION OF PEDIATRICS

President: Dr. G. A. Davis, 12 Belsize Drive, Toronto.
Secretary: Dr. Gladys Boyd, 56 DeLisle St., Toronto.
Time: November 17, December 15, February 16 and March 15.

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